

CHAPTER 4

ENVIRONMENTAL CONSEQUENCES

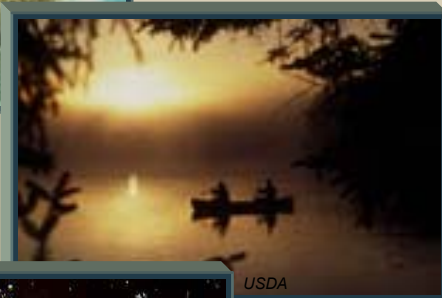
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MISSOURI RIVER FISH AND WILDLIFE MITIGATION PROJECT

FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

U.S. ARMY CORPS OF ENGINEERS
KANSAS CITY AND OMAHA DISTRICTS



USDA



Chapter 4

Environmental Consequences

4.1 INTRODUCTION

This chapter presents the potential effects on the various resources that could result from implementation of the Preferred Action, the No Development alternative, or from the No Action alternative. As was presented in Chapter 2, other alternatives were not identified for detailed evaluation. This chapter is organized by resource. Each resource section includes a brief discussion of what was included in the resource being analyzed. The potential short-term effects of construction and the long-term operational effects are presented for all three alternatives. Measures to minimize adverse effects are also presented where appropriate. Because the modified Mitigation Project has not identified specific sites for acquisition and development, the impacts analyses discussed herein were not based on a site-specific evaluation of potential effects. Rather, the analyses are at a programmatic level, and are not intended to ascertain if certain environmental consequences would

result at any locale. Evaluation of site-specific environmental consequences would be accomplished during environmental review associated with development of individual mitigation sites.

The environmental consequences chapter uses three levels of impacts to describe the anticipated impacts from the Preferred Action, the No Development alternative, and the No Action alternative including no impact, less than significant impact, and significant impact. Under the no impact category, the analysis of the resource would indicate no perceptible impact would be anticipated. A less than significant impact would be an anticipated perceptible beneficial or adverse impact that does not meet the standard for being significant. A significant impact would be an anticipated perceptible impact that meets or exceeds the general standard for significance as defined by Council on Environmental Quality (CEQ) implementing regulations as discussed below.

The CEQ guidelines indicate the significance of an impact is determined by the intensity and the context of the impact evaluated. Intensity refers to the severity or extent of an impact and context relates to the environmental circumstances at the location of the impact. The CEQ regulations for implementing the procedural provisions of NEPA (40 CFR 1508.27) specify that the following intensity and context criteria should be considered as general guidelines when determining the significance of impacts.

Intensity Evaluation should consider:

- Both beneficial and adverse impacts
- The degree to which the proposed action would affect public health or safety
- Unique characteristics of the geographic area such as proximity to historic or cultural resources, parklands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas
- The degree to which the effects on the quality of the human environment are likely to be highly controversial

- The degree to which the possible effects on the human environment are highly uncertain or could involve unique or unknown risks
- The degree to which the action may establish a precedent for future actions with significant effects
- Whether the action is related to other actions with individually insignificant but cumulatively significant impacts
- The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in, or eligible for listing in, the NRHP or may cause loss or destruction of significant scientific, cultural, or historical resources
- The degree to which the action may adversely affect an endangered or threatened species, or its habitat, that has been determined to be critical under the ESA
- Whether the action threatens a violation of Federal, state, or local law or requirements imposed for the protection of the environment

Context Evaluation should consider:

- The area or quantity of an affected resource relative to the available area or quantity of that resource
- The potential for change in reproductive success of a species and maintenance of a population at pre-project levels
- The period of recovery

A determination of significance for a particular impact may be based on one or more of the intensity criteria and the context in which the impact would occur. The context refers to the significance of an impact to society as a whole, the affected region, the affected interests, and the locality.

This chapter also presents the potential for cumulative impacts, which are the impacts on the environment that result from the incremental impact of the modified Mitigation Project when added to the impacts of other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions.

After the level of impacts has been defined, measures to minimize adverse impacts are considered in this chapter using the following guidelines:

- Avoiding the impact altogether by modifying or not taking a certain action or parts of an action
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment

- Reducing or eliminating the impact over time by preservation and maintenance of operations during the life of the action
- Compensating for the impact by replacing or providing substitute resources or environments

The use of measures to minimize adverse impacts and the effectiveness of these measures will be used, in general, by SEIS decision makers to evaluate the alternatives and in balancing the modified Mitigation Project's overall merits with its potential impacts. More specific measures to minimize adverse effects would be developed in site-specific DPRs. Development of DPRs would be the next level of project implementation the Corps would conduct on specific mitigation sites. However, DPRs and further environmental review would not be undertaken for the No Development alternative.

4.2 WATER RESOURCES

Water resource impacts were evaluated for the three alternatives for both short-term construction-related impacts and long-term post-construction impacts. The resources were evaluated in the context of the type of restoration anticipated.

4.2.1 MISSOURI RIVER HYDROLOGY

The Missouri River hydrology resource includes surface water resources within the Missouri River Basin south of Sioux City and ending in St. Louis, primarily within the boundaries of the floodplain. The floodplain area includes portions of major tributaries that feed the Missouri River such as the Platte (Nebraska), Big Nemaha, Nishnabotna, Kansas, Grand, Chariton, Osage and Gasconade Rivers. The morphology of a river is affected by its width, depth, bed characteristics, number and extent of meanders, and volume. A variety of resources were used to describe and estimate potential impacts to the hydrology of the Missouri River. The ROI was characterized using USGS water resources data, technical information from the Master Manual DEIS (Corps, 1998b) and the Master Manual Review and Update Revised DEIS (Corps, 2001), the Corps' Annual Implementation Report (Corps, 2002b), and Watershed Management to Protect Declining Species (American Water Resources Administration, 1999).

4.2.1.1 Preferred Action

The hydrology of the Missouri River could be affected by modifications within the river's floodplain. The goal of the Preferred Action is to restore fish and wildlife habitat lost as a result of the BSNP. The amount of land restored would be more than twice the amount of land authorized for restoration under WRDA86. Land acquisition would not result in hydrologic impacts; however, construction activities at certain sites to restore habitat could change the current alluvial morphology and/or floodplain dynamics. Activities involved in habitat restoration could include scouring or excavation of side channels, placement of rock to stabilize side channel inlets and outlets, removal of vegetation, excavation of soils and replacement with soils such as clays that are more conducive to supporting wetland vegetation, restoration of native vegetation to increase habitat, and other means. Design of chutes under the original Mitigation Project have followed the general guideline that up to a 10 percent reduction in main channel flow could be diverted for chute development. The limitations of acceptable diversions are site-specific. Activities associated with the original Mitigation Project included construction of low dikes, berms, wells, pumps, water delivery systems, drainage control

structures, excavation of portions of previous channels to encourage backflow, vegetative and tree plantings, and timber thinning, but not necessarily at the same location. These activities would also occur as part of the Preferred Action.

Irrigation ditches and surface water ponds are typically hydraulically connected to groundwater in the floodplains of the ROI because of the abundance of well-sorted sand and gravels. The leakage of water from ditches can recharge groundwater. For example, irrigation canals filled from Platte River, Nebraska, water have estimated leakage rates of approximately 65 percent (Wingert et. al, 1995).

Changing Missouri River flows is being considered in the Master Manual study. This SEIS is focused on the potential effects of restoring floodplain fish and wildlife habitat and does not consider the effects of changes in flows from the Missouri River operations. However, once a Master Manual decision is made, its operational characteristics would be considered in designing mitigation sites. Seasonal changes in flows normally occur that would temporarily increase or decrease habitat area.

Hydraulic properties of the Missouri River would experience a less than significant impact by the restoration and monitoring activities that would occur under the Preferred Action. These activities would be focused within the floodplain and along the exterior portions of channels rather than in the middle of the main channel. River flow could be slightly decreased in some areas by excavation of material and creating or reopening side channels. In certain locations, natural or artificial debris such as large tree stumps and trunks could be used to improve pools and shallow water habitat favorable to fish. Engineered wood alternatives could be used as artificial debris for channel rehabilitation (O'Neal et al., 1999). Engineered alternatives produce more scouring than natural wood, however, are generally more expensive than other methods (O'Neal et al., 1999). Use of natural or engineered wood alternatives is not anticipated to affect flows in the main channel.

During spring thaw months, ice jams may form on the Missouri River. Design of any structures, such as side channel chutes, would not be expected to cause ice jam formation. Implementation of the Preferred Action is not anticipated to adversely affect

river hydrology by the formation of river ice or by causing ice jams.

Hydrologic monitoring, as well as biological monitoring, of the modified Mitigation Project would be used to evaluate the effectiveness of the restoration projects on a regular basis. Monitoring data collected on and in the vicinity of the modified Mitigation Project sites would be used in adaptive management of the sites. Adjustments to the sites could be made by adding more fill, performing additional excavation, adding materials with different hydraulic properties, or performing other adjustments to improve the hydrology of the site and vicinity. Adaptive management could also be applied in the construction of new mitigation sites. As new information becomes available from existing Mitigation Project sites that would improve the effectiveness of a particular type of habitat or minimize adverse effects, the Corps and partner natural resource agencies would apply this information in future site development and management activities.

Each construction project to restore fish and wildlife habitat would consider the potential effects on Missouri River hydrology. Changes to alter the flow such as creation of side channels would be

designed to not adversely affect main channel flows. Because the Corps is required to maintain a nine-feet by 300-feet navigation channel, hydrology impacts would be minimized with additional monitoring and maintenance of the channel in the Mitigation Project areas. The modified Mitigation Project would occur over a relatively long period of time as land is acquired. Therefore, the Corps does not anticipate a significant effect on hydrology either locally or generally within the ROI. No measures to minimize adverse effects are considered necessary or recommended as a result of the Preferred Action.

4.2.1.2 No Development Alternative

Under the No Development alternative, there would be no habitat development or construction activities performed at the acquired mitigation sites. No chutes would be constructed, and as a result no modifications to river structures would be necessary to divert flows for chute development. Therefore, the Corps determined that this alternative would have no impact on Missouri River hydrology.

Because no significant adverse impacts are anticipated, no measures to minimize

adverse effects are necessary or recommended as a result of this alternative.

4.2.1.3 No Action

Under the No Action alternative, the river channel would be left in its current configuration, and those activities of the original Mitigation Project or other programs such as Section 1135 or dike notching would continue. Consequently, the flow rate and hydrologic properties of the channel would be essentially the same as currently exist. Ongoing impacts, such as regulated flow characterized by slow increases in the spring and slow decreases in late fall in the upper portion of the lower river and more variable and rapidly changing flows in the lower portion would continue. No significant impacts to the Missouri River hydrology would occur as a result of the No Action alternative.

4.2.2 GROUNDWATER HYDROLOGY

Potential impacts to subsurface water resources are addressed in this section. Flow of groundwater could be affected by modifying the terrain to improve wetland, shallow water, and terrestrial habitat.

4.2.2.1 Preferred Action

Acquisition of land for the modified Mitigation Project would not result in hydrologic impacts, but habitat construction activities could change existing groundwater hydrology. The type of restoration contemplated for the Preferred Action would be similar in nature to the original Mitigation Project. Activities likely to occur include excavation of side channels, removal of vegetation and excavation of soils and replacement with soils such as clays that are more conducive to supporting wetland vegetation, and decreasing the slope along the riverbank through addition of sediment and establishment of vegetation to increase habitat. Excavation of portions of previous channels to encourage backflow, flooding areas to create wetlands, and planting of native grasses and trees could also occur.

This SEIS analyzes potential impacts for the process of acquiring and conducting habitat restoration within the ROI, but does not evaluate site-specific impacts because site locations have not been determined. The process for selecting sites may not rely on any one particular criterion. Areas for wetland restoration could best be selected through consideration of NWI areas, areas with hydric soils, and other attributes

favorable for wetland restoration (Brown and Gersib, 1999). Likewise, areas for creation of side channels and backwater sloughs could be selected through consideration of historic river channel locations. Reversal of processes that occurred after channelization of the river, such as dewatering of oxbow lakes, and removal or modification of rock control structures could be done to help restoration efforts by enabling natural processes to occur. Site selection for certain types of habitat restoration would be improved by considering the previous hydrology conditions and habitat at a potential site.

As noted in Section 3.2.2 of this document, groundwater studies previously conducted at four sites within the floodplain of the Lower Missouri River illustrate a variety of floodplain environments. Although the particular sites for the modified Mitigation Project have not been selected, a determination of the types and extents of impacts likely from wetland creation or restoration and habitat development can be accomplished through consideration of available data at these sites.

At the four study sites, groundwater typically migrates toward and slightly downstream of the Missouri River. All sites

have clays and silts at the surface, and areas such as Tri-County Levee District 2 and L575 have shallow water tables in several areas. Performing slight modifications to hydrologic properties in particular areas with prior wetland characteristics would be the best option with the most likely success of wetland restoration.

Restoration activities for shallow water or terrestrial habitat in areas with a wider floodplain (such as RM 691) would likely result in less modification to groundwater hydrology than an area with a narrow floodplain (such as L488/497). Groundwater gradients are more gradual in wider floodplains and less influenced by subsurface flow from the bluffs at the edges of the floodplain. Modification of stream banks by excavation, fill, and introduction of natural or artificial woody debris could minimally affect groundwater in the area where activities of the Preferred Action would occur, however, the resulting effects are anticipated to be less than significant.

There is a potential that wetland creation or restoration would increase moisture levels and water table elevations adjacent to the wetland. If these areas were cultivated, there may be some times during the year

when the soil saturation level would prevent planting or recovery of crops. However, wetland mitigation is only one of the types of activities contemplated as part of the Preferred Action. If performed in areas that previously supported wetlands and considering the topography and other features, there would be a minimal amount of farmland affected. Hydrologic studies should be performed for each site where wetlands or aquatic habitat would be constructed.

Because of the flat groundwater gradient, impacts to groundwater hydrology in the ROI from construction-related activities or following construction are anticipated to be less than significant. Selection of sites for the Preferred Action should be based in part on the current hydrologic and soil properties of the site, as well as whether the site supported suitable habitat in the past. Consequently, the cost for habitat development would be minimized and the success rate would be increased. No measures to minimize adverse effects are necessary or recommended as a result of the Preferred Action. However, should off-site groundwater impacts occur, measures to minimize adverse effects would be considered. These could include acquiring enough property so that the hydrologically

related feature would be far enough from the property boundary so that no off-site effects would be experienced or redesign of adjacent drainage works. Management and development of mitigation sites would be designed to avoid impacts to off-site groundwater.

4.2.2.2 No Development Alternative

Under the No Development alternative, there would be no habitat development or construction activities on the acquired mitigation sites and, consequently, the existing hydrologic cycle and interaction between groundwater and surface water would remain unchanged. The groundwater characteristics in the ROI would remain unchanged from their present condition.

Because no significant adverse impacts are anticipated, no measures to minimize adverse effects are necessary or recommended as a result of this alternative.

4.2.2.3 No Action

Under the No Action alternative, no wetland and habitat restoration projects of the modified Mitigation Project would occur, however, those activities of the original

Mitigation Project would continue until all of the 48,100 acres authorized by WRDA86 are developed, as well as other Federal or state programs. The existing hydrologic cycle and interaction between groundwater and surface water would continue, with minor modifications in the overall interaction through the Missouri River floodplain within the ROI. The remaining area to be acquired for the original Mitigation Project is a negligible proportion of the overall ROI. The ongoing restoration effort would continue over time as properties are acquired. Impacts would be occurring at different times in different areas. Consequently, no significant adverse impacts to groundwater within the floodplain are projected to occur under the No Action alternative.

4.2.3 WATER QUALITY

Potential impacts to the quality of the surface water and groundwater are addressed in this section. Water quality of surface water bodies and groundwater can be indirectly affected by changing the quantity or volume of water in the water body or groundwater.

4.2.3.1 Preferred Action

Acquisition of the land would not result in hydrologic impacts, but restoration of the sites could cause impacts. The hydrologic environment can be modified to support wetlands, with associated riparian buffers. This could result in improved water quality. Wetlands help reduce loads of nutrients (such as nitrate and phosphorus) typical of runoff from farmlands. Reductions in one study in Iowa were in the range of 20 to 85 percent in nitrate-nitrogen for a small wetland (0.56 acres) in a watershed of approximately 64 acres; reductions were higher with increased residence in the wetland (a minimum of one to two weeks; Woltenade, 1999).

Excavation and other disturbance of ground for constructing habitat such as side channels and wetlands could cause a short-term increase in erosion or sediment deposition in tributaries and the Missouri River immediately downstream from construction activities. Increases in erosion or sediment deposition could occur through excavation (such as improvement of backwater channels) or runoff from up-gradient project sites. Existing wetlands would serve as a buffer to reduce sediment deposition in surface water bodies. Increased turbidity from construction

activities would be short-term and would occur in different reaches of the Lower Missouri River and its tributaries at different times. The modified Mitigation Project is anticipated to occur over at least a 30-year period. Short-term water quality impacts are anticipated to be localized and are anticipated to be less than significant.

Subsequent to short-term disturbances, the modified Mitigation Project would create various types of habitat that are anticipated to provide some improvements to the existing water quality in the ROI. The replacement of crops with bottomland forest, native grasses, wetlands, shallow water habitat, and other habitats would decrease agricultural runoff, and consequently decrease nitrogen and phosphorus levels in surface water bodies in the vicinity and down gradient. Decreased levels of oxygen-demanding materials would also decrease downstream from habitat restoration project sites. Therefore, there would be long-term beneficial impacts to water quality in the ROI. The temperature of water runoff would not noticeably change as a result of the Preferred Action.

During construction, best management practices (BMPs) would be implemented to

minimize adverse water quality affects. Where appropriate, revegetation through seeding of grasses would be done as soon as practical after completion of excavation and grading activities to minimize the length of time soils are exposed to erosion. Planting of trees or other vegetation would be done as appropriate to help minimize long-term transport of sediment from the site. No additional measures to minimize adverse effects are necessary or recommended to minimize impacts of the Preferred Action.

4.2.3.2 No Development Alternative

Under this alternative, there would be no construction activities or habitat development at mitigation sites; therefore, there would be no increase in short-term erosion or sediment deposition downstream, and there would be no adverse impacts to water quality in the ROI. Over the long-term, the No Development alternative would result in beneficial impacts resulting from the conversion of agricultural land to a long-term natural resource use. This would benefit water quality within the ROI due to a reduction in agricultural runoff from farming operations, however, this impact is anticipated to be less than significant.

Because no significant adverse impacts are anticipated, measures to minimize adverse effects are not necessary or recommended for this alternative.

4.2.3.3 No Action

Under the No Action alternative, no wetland and habitat restoration projects would occur as a result of the modified Mitigation Project. The activities of the original Mitigation Project would continue. Wetlands created through the original Mitigation Project or other Federal or state programs would serve to improve quality of groundwater and surface water flowing into the Missouri River. The remaining area to be acquired for the original Mitigation Project is a negligible proportion of the overall ROI. The original Mitigation Project restoration effort would continue over time as the remaining acreage is acquired. Impacts from original Mitigation Project construction would be localized and would occur at different times in different areas. However, no further water quality improvement would occur as the result of wetland and other habitat creation from the Mitigation Project. Consequently, no impacts to water quality are projected to occur under the No Action alternative.

4.2.4 FLOOD CONTROL

Flood control impacts could result from modification of resources within the floodplain to improve wetland, shallow water, and terrestrial habitat.

4.2.4.1 Preferred Action

Acquisition of land for the modified Mitigation Project would not result in flood control impacts, but construction activities of the Preferred Action could change flooding characteristics. As discussed previously, the location, areal extent, and type of habitat restoration activities at particular locations are not known at this time. This SEIS is programmatic in nature and addresses potential impacts of the modified Mitigation Project, but not on a site-specific basis.

The original Mitigation Project included modification of existing river structures and it is anticipated that similar activities (for example, modification, relocation, or removal of some levees and tributary flood control structures) would occur as part of the Preferred Action. Indirect effects to flooding characteristics could also occur from modification of features in the floodplain, such as excavation of side and backwater channels or insertion of natural

or artificial materials to improve shallow water habitat. The majority of lands protected with flood control structures are dedicated to agricultural land use. The ROI has approximately 45 percent of the floodplain protected by levees. Missouri has the most at 62 percent and Nebraska has the least at approximately 10 percent of floodplain lands protected by levees. The acreage proposed for the modified Mitigation Project (118,650 acres) is a small proportion (approximately 5.7 percent) of the floodplain acreage in the ROI. The Corps does not anticipate removal or modification of flood control structures that would adversely impact urban development or privately owned agricultural lands, farming operations, or structures.

Habitat construction could result in seasonal flooding of the acquired mitigation site property. Potential modifications to flood control structures or relocation of levees may be necessary to accomplish habitat restoration on sites acquired for the Preferred Action. Setback of levees to increase flooding on acquired project sites would be designed to maintain flood protection of nearby private lands. Setback of any levee associated with the Preferred Action would, in concept, increase the flood storage capacity, and thereby increase

flood protection downstream of the levee modification. This potential positive effect is not anticipated to be significant, however, it must be recognized. The amount of increased flood storage would be proportional to the amount of land added to the area inside of the levees set back as part of the Preferred Action. Because sites have not been identified for acquisition, no estimate of the potential increase in flood storage capacity is possible.

Selection of sites for different types of habitat projects would be done using criteria to identify areas that would minimize costs for modification and would minimize the potential for adverse impacts to adjacent lands. Criteria would also include the ability to reconnect the floodplain with the river, increase flood storage, and decrease flood damages as best as possible with a willing seller policy. Development of mitigation sites would consider flood potential. Site-specific hydrology and hydraulics analysis would be conducted during development of mitigation site DPRs. Although it would be possible that flooding could continue to occur on private lands adjacent to mitigation sites, flooding would not be anticipated to increase as a result of the Preferred Action. The long-term revegetation of the floodplain at mitigation sites could result in an

increase in the roughness of flood conveyance, which may potentially result in an increase in stage and flood heights at mitigation sites. This would be incorporated into the planning of a mitigation site and, through hydrologic studies, necessary modifications would be made to levees and river structures to account for any localized problems.

Levees and other flood control structures would be maintained by local entities, association funds, or private funds. Potential effects on Federal funding for levee repairs are discussed in Section 4.5.3.1 for this alternative. Flood control measures may be considered at specific sites. These measures would be addressed in subsequent development of DPRs and NEPA documents on the specific activities planned for individual sites.

4.2.4.2 No Development Alternative

Acquisition of land under the No Development alternative would not result in flood control impacts in the ROI. Under the No Development alternative, there would not be any construction activities (e.g., levee setbacks or realignments) such as those that have been part of the original Mitigation Project and could occur under the Preferred Action. Therefore, flood

storage capacity and flood control in the ROI would remain relatively unchanged under the No Development alternative. As with the Preferred Action, the long-term revegetation of the floodplain at mitigation sites could result in an increase in the roughness of flood conveyance, which may potentially result in an increase in stage and flood heights at mitigation sites, however, this is anticipated to be a less than significant impact. Levees and other flood control structures would be maintained by local entities, association funds, or private funds. Potential effects on Federal funding for levee repairs are discussed in Section 4.5.3.2 for this alternative.

No measures to minimize adverse effects are necessary or recommended as a result of the No Development alternative.

4.2.4.3 No Action

Under the No Action alternative, no additional fish and wildlife habitat restoration would occur except for the 48,100 acres previously authorized by WRDA86 or by other Federal or state programs. Implementation of the No Action alternative would not result in any further modifications to the river channel and flood control features within the ROI besides that authorized under WRDA86. Levees and

other flood control structures would likely be maintained by local entities, association funds, or private funds. In the event that a levee is damaged or breached by a flood event, Federal funds for levee repairs would still be available for Federal and qualifying non-Federal levees. Consequently, the potential for flooding would be essentially the same as presently exists. Ongoing impacts, such as overtopping of small levees and occasional flooding, would continue. Because no modification of existing flood control structures would be performed, no impacts to Missouri River flood control would occur as a result of this alternative.

4.3 BIOLOGICAL RESOURCES

The three alternatives were evaluated to determine potential impacts anticipated from each alternative during and after construction. The existing biological resources within the ROI were evaluated in the context of the types of restoration and the acres proposed for mitigation site development.

4.3.1 WETLANDS

Impacts to wetland resources were assessed by determining whether the alternatives under consideration would

cause the loss of wetlands or result in a beneficial net increase in wetlands. There was a lack of accurate data for estimating the acres of wetlands currently found in the Lower Missouri River floodplain, however, available estimates used were considered adequate for assessing the potential effects of the modified Mitigation Project on wetland resources in the ROI.

4.3.1.1 Preferred Action

Implementation of the Preferred Action would result in the development of 118,650 acres for fish and wildlife habitat in the ROI. The Preferred Action would include the development of 7,000 to 20,000 acres of shallow water habitat to achieve a goal of 20-30 acres per mile. The development of shallow water habitat would be completed primarily through the construction and restoration of side channels, chutes, backwater areas, and slack water habitat adjacent to the channel. Other activities to increase shallow water habitat may include the modification of river structures, dike notching, and the construction of wetland cells. Construction of some project features may require the disturbance or fill of existing wetlands resulting in small, localized impacts. As examples, some wetland vegetation could be damaged or a wetland could be temporarily drained during

construction to expand the size of the existing wetland or during construction of an adjacent wetland. These impacts would be considered less than significant. Construction of mitigation sites and project features would require compliance with regulations established under Section 404 of the Clean Water Act. These requirements would be evaluated and fulfilled on a site-specific basis during implementation of the Preferred Action.

A major component of the Preferred Action would include wetland restoration and construction. Other project features would reestablish hydraulic connectivity between the main channel of the Missouri River and its floodplain that would provide additional benefits to wetlands. Therefore, no significant adverse impacts are anticipated to occur to wetlands as a result of the Preferred Action. The purpose of the Mitigation Project is to restore fish and wildlife habitat that would include wetland restoration and construction, and would not result in a loss of wetland resources that currently exist in the ROI. The Preferred Action would result in significant long-term benefits to wetland resources within the ROI.

The quality of restored wetlands would depend on site characteristics. The selection of sites for wetland creation would consider the potential quality of the wetlands that could be restored at a mitigation site and an adaptive management process would be used to maximize the quality of restored wetlands for fish and wildlife. This would include maintaining wetland cells as permanent or seasonal wetlands, as they would differ in value to fish and wildlife. The Corps anticipates that adverse construction-related wetland impacts would be less than significant and there would be a significant long-term net increase in wetland acreage; therefore, measures to minimize adverse effects are not required.

4.3.1.2 No Development Alternative

Under the No Development alternative, wetlands could only reestablish naturally over the long-term. No construction of wetlands, installation of water delivery systems, or pumps would occur. Therefore, the No Development alternative would not result in short-term impacts to wetlands from construction activities. The reestablishment of wetlands under this alternative would depend, in a large part, on the location of the lands acquired. For example, land acquired on the riverside of

levees would be taken out of its current land use and wetland habitats would be allowed to reestablish if conditions allowed. If lands were acquired on the protected side of a levee, wetland reestablishment would likely not occur as rapidly or at all because these lands would still be cut off from the main channel by the levee and there would be no activities to develop wetlands. Construction of chutes and side channels that could cause development of associated wetlands would not occur. Current farmed wetlands would no longer be cultivated and would be allowed to reestablish as natural wetlands, but this would be only as site conditions would allow. This alternative would result in the reestablishment of only opportunistic wetlands that would be more variable in habitat quality. Flood events could cause scouring and formation of wetlands within levees, however this would be anticipated to occur infrequently and on a limited basis. Although there would be long-term beneficial impacts to wetlands in the ROI as a result of the No Development alternative due mainly to the removal of land from agricultural land use, the benefits to wetlands would not be as great as those that would result from Preferred Action activities such as levee setbacks, that increase the acres of land connected to the

main channel, construction of wetland cells, and construction of aquatic habitat.

No measures to minimize adverse effects are necessary or recommended as a result of the No Development alternative.

4.3.1.3 No Action

Under the No Action alternative, no additional fish and wildlife habitat restoration would occur except for the 48,100 acres previously authorized by WRDA86 or by other Federal or state programs. Implementation of the No Action alternative would not result in any further benefits to wetlands within the ROI as a result of the Mitigation Project. The No Action alternative would result in a significant adverse impact to wetlands within the floodplain due to the continued degraded state of the Missouri River ecosystem.

4.3.2 VEGETATION

Impacts to vegetation were assessed by determining whether the alternatives under consideration would cause the permanent loss of important vegetation.

4.3.2.1 Preferred Action

Implementation of the Preferred Action would result in the development of 118,650 acres for fish and wildlife habitat in the ROI including the restoration of terrestrial habitat, such as bottomland forest, native prairie, and wetland habitat. This would be accomplished primarily through plantings and allowing the natural regrowth of native species. Other management options may include flooding, burning, or disking in order to encourage the natural revegetation process. Construction of project features such as side channels and chutes may require limited clearing of vegetation for installation of inlet or outlet structures, or through scouring to create the side channel. In some cases, levees may be setback that could result in impacts to existing vegetation. These impacts would be considered less than significant. The Preferred Action would result in a long-term net increase in native vegetation at the mitigation sites, and a long-term benefit within the ROI. The purpose of the Mitigation Project is to restore fish and wildlife habitat that would include the restoration of vegetation native to the Lower Missouri River floodplain, and would not result in a loss of native vegetation that currently exists in the ROI.

The main effect on vegetation from implementation of the Preferred Action would be a conversion from row crops to native forbs and woody trees and shrubs. Two current ecological restoration sites on the Lower Missouri River floodplain illustrate the potential benefits to vegetation. The Benedictine Bottoms mitigation site, previously described in Section 3.3.6, Existing Mitigation Sites (Figure 3.3-9), and the Lisbon Bottom unit of the Big Muddy NFWR were primarily in row crop vegetation (corn, soybeans, or wheat) prior to restoration. Lisbon Bottom was created as a result of flood disturbance and is a passive management site (i.e. no construction and no planting were performed). Figure 4.3-1 shows the Benedictine Bottoms in agricultural land use prior to development as wetland and terrestrial habitat. This figure also shows the Benedictine Bottoms site seven years after commencement of habitat restoration. The two photographs demonstrate the dramatic difference in vegetation after only seven years. As of 1999, floristic studies conducted by Benedictine College in Atchison, Kansas on the Benedictine Bottoms mitigation site have inventoried 127 plant species present (James, 2002). Eighty plant species have been documented in the post-flood vegetation at

**Figure 4.3-1
Benedictine Bottoms Before and After Habitat Development.**



the Lisbon Bottom and the majority of these species were annual wetland forbs (Humburg and Burke, 1999).

The Corps anticipates that unavoidable adverse construction-related vegetation impacts would be less than significant and there would be significant long-term positive benefits to vegetation; therefore, measures to minimize adverse impacts are not required.

4.3.2.2 No Development Alternative

The main effect on vegetation from implementation of the No Development alternative would be the conversion of row crops to native floodplain vegetation that would occur. Under this alternative, no planting of native species would occur and

revegetation would occur over several years or decades. Restoration of habitat would be accomplished through natural regrowth of native species. As a result, there would likely be a greater dominance of species such as cottonwoods and willows rather than mast-producing hardwoods due to the altered seed base at most potential mitigation sites. Revegetation would also be opportunistic and would likely be less diverse with a more monotypic plant composition at mitigation sites. As discussed previously in Section 4.3.2.1, Preferred Action, the USFWS' Lisbon Bottom is a passive management site (i.e. no construction and no planting were performed). Eighty plant species have been documented at the site and a majority were annual wetland forbs (Humburg and Burke, 1999). Because no

habitat development or construction activities would take place, there would be no short-term construction-related impacts to vegetation. The No Development alternative would result in a significant long-term beneficial impact to vegetation within the ROI.

No measures to minimize adverse effects are necessary or recommended as a result of the No Development alternative.

4.3.2.3 No Action

Under the No Action alternative, no additional fish and wildlife habitat restoration would occur except for the remaining portion of the 48,100 acres previously authorized by WRDA86 or by other Federal or state programs. Implementation of the No Action alternative would not result in further benefits to native vegetation within the ROI as a result of the Mitigation Project. The No Action alternative would result in a significant adverse impact to vegetation within the floodplain due to the continued degraded state of the Missouri River ecosystem.

4.3.3 WILDLIFE

Impacts to wildlife were assessed by determining whether the alternatives under

consideration would cause the loss of wildlife habitat. In this evaluation, wildlife was considered as all the species of mammals, birds, reptiles, and amphibians, known to currently occur in the ROI.

4.3.3.1 Preferred Action

The purpose of the modified Mitigation Project is to restore fish and wildlife habitat lost as a result of the BSNP. By the nature of the Mitigation Project, the Preferred Action evaluated in this section is intended to be beneficial to wildlife. Mitigation sites would include restoration and construction of habitat, such as bottomland forest, native prairie, and wetlands. These habitats would provide a net increase in habitat for wildlife species. The construction of chutes, side channels and backwater habitats would provide additional habitat for aquatic wildlife species. Construction of project features associated with the Preferred Action could result in the temporary displacement and/or disturbance of resident wildlife. These short-term wildlife impacts are considered less than significant. The Preferred Action would result in significant long-term benefits to wildlife and wildlife habitat in the ROI.

Available information for two ecological restoration sites on the Lower Missouri

River provide an indication as to the wildlife diversity that could be expected on mitigation sites that are part of the Preferred Action, and the benefits to wildlife that would result from the Preferred Action. The first site is the Benedictine Bottoms mitigation site previously described in Section 3.3.6, Existing Mitigation Sites. Benedictine College has been conducting monitoring of mammals, birds, reptiles and amphibians, and aerial and terrestrial invertebrates on the site since 1994. A total of 21 mammal species are known to occur at the Benedictine Bottoms site. Eleven of these are small mammal species that have been trapped at the Benedictine Bottoms site. The most abundant small mammal species at the site are the deer mouse (*Peromyscus maniculatus*), hispid cotton rat (*Sigmodon hispidus*), prairie vole (*Microtus ochrogaster*), and house mouse (*Mus musculus*; Lindquist, 2002). The number of white-tailed deer surveyed at Benedictine Bottoms has increased from an average of 30 deer per survey in 1994 to 72.6 in 2000 (Kellner, 2002). The number of bird species observed at Benedictine Bottoms increased from 41 species in 1994, the first year of monitoring, to 94 species in 1995 (Hellmer, 2002). The numbers of bird species seen from 1996-1999 were 86, 90, 55, and 59 respectively. A total of 137 bird

species have been observed at the site since 1994 and regression analysis predicts a complete avifauna of 160 species on the site (Hellmer, 2002). Ten species of reptiles and 13 species of amphibians have been documented on the site. The most abundant reptile and amphibian species at the site have been the western chorus frog (*Pseudacris triseriata triseriata*), false map turtle (*Graptemys pseudogeographica*), and red-eared slider (*Trachemys scripta elegans*; Nations, 2002).

The second site is the Lisbon Bottom unit of the Big Muddy NFWR. Lisbon Bottom consists of 2,200 acres of floodplain along the Missouri River in Howard County, Missouri at RM 213 to 219. The USFWS acquired the land for the Big Muddy NFWR after the flood of 1993 breached the levees protecting the agricultural area. Nineteen species of mammals were documented to occur on the Lisbon Bottom site during surveys conducted in the fall of 1996 and spring of 1997 (Humburg and Burke, 1999). Nine species of small mammals were captured, with the white-footed mouse (*Peromyscus leucopus*), deer mouse, and house mouse being the most common. Other species found to be common on the site included raccoon, Virginia opossum, cottontail rabbit, and white-tailed deer. As

of 1997, 62 species of waterbirds have been recorded at the Lisbon Bottom site. Total numbers of species observed were 31 in 1994, 37 in 1995, 39 in 1996, and 35 in 1997 (Humburg and Burke, 1999). Shorebirds and waterfowl accounted for the greatest number of species and individuals observed. Seven reptile species and 12 amphibian species have been recorded at Lisbon Bottom as of 1997 (Humburg and Burke, 1999). All of the wet areas investigated at Lisbon Bottom appear to be inhabited by herpetofauna and some sites appear particularly species rich.

The Corps anticipates that unavoidable adverse construction-related wildlife impacts would be less than significant and there would be significant long-term positive benefits to wildlife and wildlife habitat; therefore, measures to minimize adverse effects are not required.

4.3.3.2 No Development Alternative

This alternative would result in the acquisition of 118,650 acres of primarily agricultural land for fish and wildlife habitat in the ROI. The No Development alternative would be beneficial to wildlife and wildlife habitat. Wildlife benefits at the Benedictine Bottoms and Lisbon Bottom sites were described in Section 4.3.3.1,

Preferred Action. Wildlife diversity would likely be less with the No Development alternative than for the Preferred Action. There would be no short-term impacts to wildlife because construction or habitat development would not be performed. The No Development alternative would still result in a significant long-term beneficial impact to wildlife in the ROI.

No measures to minimize adverse effects are necessary or recommended as a result of the No Development alternative.

4.3.3.3 No Action

Under the No Action alternative, no additional fish and wildlife habitat restoration would occur except for the remaining portion of the 48,100 acres previously authorized by WRDA86 or by other Federal or state programs. Implementation of the No Action alternative would not result in further benefits to wildlife within the ROI as a result of the Mitigation Project. The No Action alternative would result in a significant adverse impact to wildlife within the floodplain due to the continued degraded state of the Missouri River ecosystem.

4.3.4 FISHERIES

Impacts to fisheries were assessed by determining whether the alternatives under consideration would cause the loss of aquatic habitat.

4.3.4.1 Preferred Action

The authorized purpose of the Mitigation Project is to restore and preserve fish and wildlife habitat to mitigate for impacts to fish and wildlife that occurred as a result of the BSNP. Implementation of the Preferred Action would result in the acquisition and development of 118,650 acres for fish and wildlife habitat along the Lower Missouri River, including 7,000 to 20,000 acres of shallow water habitat that would support fisheries. The development of shallow water habitat would be completed primarily through the construction and restoration of side channels, chutes, backwater areas, and pools and slack water areas adjacent to the channel. Chutes create a diversity of shallow water habitat that is important as nursery and rearing areas for Missouri River fishes. Jennings (1979) found that chutes produced the greatest numbers and weights of benthic organisms per sampler set than other aquatic habitats sampled. In 1996, high river flows allowed for a chute to develop at the Lisbon Bottom area that is

now a unit of the Big Muddy NFWR. Species richness in the chute was found to be greater than that of the adjacent Missouri River channel and several rare species including sicklefin chub, sturgeon chub, plains minnow, blue sucker, American eel, and hybrid pallid sturgeon were found in the chute (Humburg and Burke, 1999). Notched dikes are intended to increase flow behind dikes to retard or halt accretion of new sediment or to scour and transport existing sediment (Jennings, 1979). The result is a diversity of habitats including shallow water, deep-water pools, and slack water. Pallid sturgeon were found in association with notched dikes near the Overton Bottoms in the spring of 2002 (USFWS, 2002). Notched dikes and chutes provided more suitable habitat for fish than the border of the main Missouri River channel (Jennings, 1979). By the nature of the Mitigation Project, the Preferred Action was intended to be beneficial to the fishery of the Missouri River. Construction of these project features may result in temporary disturbance to fish in construction areas; however, these short-term impacts are considered less than significant due to the small areal extent of the work and the mobility of fish. The long-term benefit of the Preferred Action to the fishery of the

Missouri River would include reconnecting the Missouri River and the floodplain, an increase in important shallow water habitat, a long-term increase in fishing and other outdoor recreation, and a potential long-term benefit to commercial fishing on the Missouri River.

The Corps anticipates that adverse construction-related fisheries impacts would be insignificant and there would be significant long-term positive benefits to fisheries; therefore, measures to minimize adverse effects are not required.

4.3.4.2 No Development Alternative

No aquatic habitat, chutes or wetland cells would be constructed and no in-river structural modifications would occur as part of this alternative. There would be no short-term construction-related impacts to fisheries as a result of the No Development alternative. The increase in aquatic habitat available for fisheries would be minimal. There would be no construction/restoration of chutes, side channels, or sloughs. No levee setbacks or realignments would occur to restore the floodplain. It would be possible that flood events could breach old levees, create new chutes, and side channels, and increase the amount of shallow water habitat, however, this is

anticipated to occur infrequently and on a limited basis. The No Development alternative would not contribute to compliance with the BiOp or avoidance of jeopardy of the pallid sturgeon as is discussed in Section 4.3.5.2. The removal of 118,650 acres from primarily agricultural use would increase ecosystem health in the long-term by reducing agricultural runoff into the Missouri River and thereby improving water quality that would be beneficial to the Lower Missouri River fishery. In addition, there would be an increase in available wetland habitat in the floodplain as a result of land acquisition. Wetlands can be important areas for spawning, nursery areas, and other life-cycle requirements of fisheries, if connected to the river. However, because no activities would be undertaken to connect shallow water habitat to the Missouri River, no appreciable increase in the amount and quality of shallow water habitat would occur. Therefore, the No Development alternative would result in a significant adverse impact to fisheries within the floodplain due to the continued degradation of the existing Missouri River ecosystem. This is a similar impact as that described for the No Action alternative.

4.3.4.3 No Action

Under the No Action alternative, no additional fish and wildlife habitat restoration would occur except for the remaining portion of the 48,100 acres that was previously authorized by WRDA86 or by other Federal programs, such as dike notching, and state programs. Implementation of the No Action alternative would not result in any further benefits to fisheries within the ROI as a result of the Mitigation Project. The No Action alternative would result in a significant adverse impact to fisheries within the floodplain due to the continued degradation of the existing Missouri River ecosystem.

4.3.5 THREATENED AND ENDANGERED SPECIES

Impacts to Federally listed threatened and endangered species were assessed as to the potential for the modified Mitigation Project to affect critical habitat, jeopardize the continued existence of a listed threatened or endangered species, or result in the taking of an individual or habitat of a threatened or endangered species.

4.3.5.1 Preferred Action

Implementation of the Preferred Action would result in the acquisition and

development of 118,650 acres for fish and wildlife habitat along the Lower Missouri River, including the restoration of habitats that were native to the Lower Missouri River floodplain. The Preferred Action would not result in a loss of the threatened and endangered species habitat that currently exists in the ROI. Construction of mitigation sites could temporarily displace or disturb threatened or endangered species located on a given mitigation site. Prior to construction activities at a mitigation site, consultation with the USFWS and the appropriate state wildlife agency, along with field investigations, would be performed to identify the potential for, or presence of, threatened and endangered species. Through coordination with the USFWS, if a threatened or endangered species would be found to occur at a mitigation site, measures would be taken to avoid impacts to that species; therefore, construction activities are not likely to adversely impact threatened or endangered species. Rather, the implementation of the Preferred Action is anticipated to provide significant benefits to many species, including threatened and endangered species by increasing habitat beneficial to the listed species of the Lower Missouri River floodplain ecosystem.

The BiOp issued by the USFWS called for the creation or restoration of approximately 20,000 acres of shallow water habitat, to achieve a goal of 20-30 acres per mile, to benefit the endangered pallid sturgeon (USFWS, 2000). The increased shallow water habitat resulting from the Preferred Action would provide important habitat for the pallid sturgeon. The Preferred Action could also provide additional migratory, foraging, and possibly nesting habitat in the upper extent of the ROI for the interior least tern and piping plover. Restoration of wetland and bottomland forest habitat would provide important roosting and foraging habitat for the Indiana bat. Bald eagles would benefit from decreased human disturbance associated with current land use practices, increased habitat and wildlife for prey, and long-term increases in trees suitable for nesting and perching. In general, all identified threatened and endangered species (Table 3.3-2) would benefit from increased aquatic and terrestrial habitat.

The Corps determined that construction-related activities would not likely adversely affect any listed species, and there would be significant long-term positive impacts to threatened and endangered species. However, the Corps will consult with the

USFWS and state wildlife agencies regarding threatened and endangered species issues as required by the ESA and site-specific DPRs would address specific site issues. Measures to avoid adverse impacts to threatened and endangered species would be conducted on a site-by-site basis as may be required. Coordination with the USFWS will ensure that measures are taken to avoid adverse impacts on a site-by-site basis.

4.3.5.2 No Development Alternative

Implementation of the No Development alternative would result in acquisition of 118,650 acres of habitat along the Lower Missouri River. The No Development alternative would not result in a loss of the threatened and endangered species habitat that currently exists in the ROI. There would be no potential for adverse impacts to threatened and endangered species because no construction activities would occur under this alternative, and no existing habitat would be affected. The availability of 118,650 acres along the floodplain of the Lower Missouri River for wildlife would provide potential habitat for threatened and endangered species that require such floodplain habitats. There would be a less than significant beneficial impact to terrestrial and avian threatened and

endangered species in the ROI over the long-term. Under this alternative, no aquatic habitat (i.e. chutes and shallow water habitat) would be developed. The USFWS has stated in its BiOp that approximately 20,000 additional acres of shallow water habitat, to reach a goal of 20-30 acres per river mile, are necessary to avoid jeopardizing the endangered pallid sturgeon (USFWS, 2000). The No Development alternative would not contribute to compliance with the BiOp or avoid jeopardizing the pallid sturgeon. This is considered a significant adverse effect on the endangered pallid sturgeon.

Because no development would occur under this alternative, no measures to minimize adverse effects to threatened and endangered species are recommended as a result of this alternative. However, the Corps would be required to find another means of meeting the habitat development requirements of the BiOp for pallid sturgeon. Currently, the Missouri River Fish and Wildlife Mitigation Project, as described in the Preferred Action, is a significant tool for the Corps to use in compliance with the BiOp and avoiding jeopardy for the pallid sturgeon.

4.3.5.3 No Action

Under the No Action alternative, no additional fish and wildlife habitat restoration would occur except for the remaining portion of the 48,100 acres previously authorized by WRDA86 or by other Federal or state programs. Implementation of the No Action alternative would not result in further benefits to threatened and endangered species within the ROI as a result of the Mitigation Project. Implementation of the No Action alternative may potentially result in the continued decline and extinction of the endangered pallid sturgeon. The USFWS has stated in its BiOp that approximately 20,000 additional acres of shallow water habitat are necessary to avoid jeopardizing the pallid sturgeon. The continued degraded state of the Missouri River ecosystem could potentially lead to the decline and eventual listing under ESA of other species dependent on the Missouri River and its floodplain. Therefore, the No Action alternative would result in a significant adverse impact to threatened and endangered species.

4.4 LAND USE AND OWNERSHIP

4.4.1 LAND USE

The BSNP has caused a significant alteration of land use in the ROI over the past 90 years through the construction of revetments and transverse dikes to stabilize the river into a single channel. Construction of the BSNP has allowed the conversion of a dynamic river ecosystem to predominantly new agricultural land. By the year 2003, it is estimated that 522,000 acres of aquatic and terrestrial habitat will have been eliminated from the natural channel and meander belt for primarily agricultural use (Table 1.2-1; Corps, 1981). Between approximately 71 to 87 percent of the floodplain in each region of the ROI is in agricultural production, and generally less than 5 percent is urban and built-up land (Corps, 1995). Potential effects on land use of the three alternatives are considered in the context of the change from agricultural use to fish and wildlife habitat.

4.4.1.1 Preferred Action

The locations of specific mitigation sites that would be acquired are not known at this time. However, implementation of the modified Mitigation Project would cause changes to land use in the floodplain of the

46-county ROI. The Preferred Action would acquire 118,650 acres for development of fish and wildlife habitat in the floodplain of the Lower Missouri River. Because agriculture is the predominant land use of the floodplain, it is likely that agricultural land would comprise a majority of land acquired for the Preferred Action. However, agricultural land would include some farmed wetlands. As indicated on Table 3.4-1, other land use categories within the floodplain include urban/built-up, range, forest, wetland, water, and barren. It is unlikely that any urban/built-up land would be acquired. It was assumed in this analysis that the modified Mitigation Project would convert agricultural land, although some barren and rangeland would also be converted. Some forest and wetlands would also likely be acquired. Also, some development of 118,650 acres of fish and wildlife habitat would occur on existing public lands.

The loss of agricultural land would reduce revenue for landowners and the county tax base; this impact is discussed in Section 4.5, Socioeconomic Resources. Acquisition of the total 118,650 acres within the floodplain would convert less than 1 percent of the total acreage in the ROI and approximately 5.7 percent of the total

floodplain. Overall land use in the ROI would change only negligibly. Potential impacts to agricultural land within each state and region were also considered. For this analysis, it was assumed that the 118,650 acres to be acquired would be equally proportioned within each state and region based on the amount of riverbank miles within each state and region, and that the entire 118,650 acres would currently be in agricultural land use. The distribution of acres by state and region in this analysis was for comparison purposes only. WRDA99 does not require a particular allocation of acres. Given the Corps' preference for purchasing lands from willing sellers rather than establishing land acquisition goals for any state, region, or county, it is highly unlikely that there would be a concentration of acquired lands in any area that would significantly alter the outcome of this analysis. Table 4.4-1 summarizes the potential effect on the amount of agricultural land in the ROI by state and region. The four states could lose between approximately 9,300 acres in Kansas to approximately 75,700 acres in Missouri. On a percentage basis, it is estimated that the four states could lose between 0.6 to 1.2 percent of the agricultural land in the ROI. Consideration of the potential effect by region shows

similar results. Region 2 would lose approximately 43,000 acres or approximately 0.8 percent of the agricultural land in the region. Region 4 would lose approximately 22,700 acres or 1.6 percent. Region 1 would lose approximately 14,000 acres, or 0.7 percent of the agricultural land in that region of the ROI. The Corps considers loss of these relatively low percentages of agricultural land to be less than significant. No measures to minimize adverse effects are necessary or recommended for the Preferred Action.

4.4.1.2 No Development Alternative

The No Development alternative would result in the transfer of 118,650 acres of privately owned agricultural land to publicly controlled land designated for wildlife habitat use. The effects on existing land use resources were considered to be less than significant and similar to those described for the Preferred Action as shown on Table 4.4-1. Under the No Development Alternative, the land purchased for habitat conservation use would develop naturally over time into 118,650 acres of primarily terrestrial habitat. As with the Preferred Action, the conversion of one percent or less of agricultural land use to wildlife habitat in the ROI is considered a less than

Table 4.4-1**Agricultural Land Use Conversion in ROI**

	Iowa	Kansas	Missouri	Nebraska	ROI
Total ROI Land Area (acres)¹	2,684,108	1,298,300	9,582,473	2,748,715	16,313,596
Percent of Riverbank Miles	11.9	7.8	63.8	16.5	100.0
Total ROI Agricultural Land (acres)¹	2,464,796	1,032,339	6,124,149	2,472,495	12,093,780
Land to be Acquired²	14,120	9,280	75,717	19,533	118,650
Percent of ROI Agricultural Land Converted	0.6	0.9	1.2	0.8	1.0
	Region 1	Region 2	Region 3	Region 4	ROI
Total ROI Land Area (acres)¹	3,284,267	5,982,915	3,840,654	3,205,761	16,313,596
Percent of Riverbank Miles	17.2	36.6	27.1	19.1	100.0
Total ROI Agricultural Land (acres)¹	2,740,935	5,137,336	2,817,821	1,397,689	12,093,780
Land to be Acquired²	20,408	43,426	32,154	22,662	118,650
Percent of ROI Agricultural Land Converted	0.7	0.8	1.1	1.6	1.0

¹ Adapted from USGS, EROS Data Center, 1992-1995.² Assumes land acquisition will be proportioned based on riverbank miles as discussed in text.

significant adverse impact to land use under the No Development alternative.

No measures to minimize adverse effects are necessary or recommended for the No Development alternative.

4.4.1.3 No Action

Under the No Action alternative, no land would be acquired and converted from current land use practices to fish and wildlife habitat, except for the remaining acreage to be acquired as part of the original Mitigation Project or by other Federal or state programs. Therefore, no impacts to land use would occur under the No Action alternative.

4.4.2 LAND OWNERSHIP

Land within the floodplain of the ROI is nearly all privately owned, with a small proportion of Federal and state ownership (less than 1 percent). Potential effects on land ownership from the Preferred Action, the No Development alternative, and the No Action alternative were considered in the context of the amount of land to be acquired. Potential effects on tax revenues are discussed in Section 4.5, Socioeconomic Resources.

4.4.2.1 Preferred Action

The locations of specific mitigation sites that would be acquired are not known. However, implementation of the Preferred

Action would cause some changes to land ownership in the floodplain of the ROI. The Preferred Action would acquire 118,650 acres for development of fish and wildlife habitat in the floodplain of the Lower Missouri River. As noted under Section 4.4.1.1, agricultural land would likely comprise a majority of the land acquired because agricultural land is the dominant land use type in the floodplain, and this land is privately owned. Although some of the 118,650 acres of fish and wildlife habitat would be developed on existing public lands, this analysis assumed that the entire acreage would come from private land. Acquisition of 118,650 acres of privately owned land within the floodplain would represent less than 1 percent of the total private acreage in the ROI.

The number and size of parcels to be acquired is unknown. Sites being acquired for the original Mitigation Project range in size from hundreds of acres to several thousand acres. Multiple landowners would be affected under the Preferred Action. Landowners with extensive holdings could be affected by more than one acquisition, but this is unlikely because of the large expanse of the floodplain. Section 4.5 addresses socioeconomic impacts associated with the acquisitions of parcels

not yet known by location, size, and number.

Table 4.4-2 summarizes the anticipated effects on land ownership in the four states, the four regions, and the ROI. While the Corps has not identified where the land acquisition would occur, nor has it determined any amount per state, this analysis assumed that the land acquisition would be proportioned by state and by region based on the relative amount of riverbank miles within each state or region. The distribution of acres by state and region in this analysis is for comparison purposes only. WRDA99 does not require a particular allocation of acres. Given the Corps' preference for purchasing lands from willing sellers rather than establishing land acquisition goals for any state, region, or county, it is highly unlikely that there would be a concentration of acquired lands in any area that would significantly alter the outcome of this analysis. Based on these assumptions, Kansas would experience the least acreage acquired at approximately 9,300 acres. Missouri would experience the most at approximately 75,700 acres. However, these acreages represent just 0.7 and 0.8 percent of the privately owned land in the ROI of each respective state. Nebraska would also experience 0.7

Table 4.4-2**Land Ownership Change in ROI**

	Iowa	Kansas	Missouri	Nebraska	ROI
Total ROI Land Area (acres) ¹	2,684,108	1,298,300	9,582,473	2,748,715	16,313,596
Percent of Riverbank Miles	11.9	7.8	63.8	16.5	100.0
Public Land in the ROI (acres) ¹	26,907	2,172	70,028	15,444	114,550
Private Land in the ROI (acres) ¹	2,657,201	1,296,128	9,512,445	2,733,272	16,199,046
Land to be Acquired ²	14,120	9,280	75,717	19,533	118,650
Percent of ROI Private Land Converted	0.5	0.7	0.8	0.7	0.7
	Region 1	Region 2	Region 3	Region 4	ROI
Total ROI Land Area (acres) ¹	3,284,267	5,982,915	3,840,654	3,205,761	16,313,596
Percent of Riverbank Miles	17.2	36.6	27.1	19.1	100.0
Public Land in the ROI (acres) ¹	24,056	44,397	29,631	16,465	114,550
Private Land in the ROI (acres) ¹	3,260,211	5,938,518	3,811,022	3,189,295	16,199,046
Land to be Acquired ²	20,408	43,426	32,154	22,662	118,650
Percent of ROI Private Land Converted	0.6	0.7	0.8	0.7	0.7

¹ USGS, Columbia Environmental Research Center, 2001² Assumes land acquisition will be proportioned based on riverbank miles as discussed in text.

percent and Iowa would have the lowest at 0.6 percent of the privately owned land in the ROI converted to public ownership. Table 4.4-2 also shows a similar amount of privately owned land converted to public land in each region and the entire ROI, ranging from 0.6 to 0.8 percent. For the entire ROI, the potential effect of converting 0.7 percent of private land to public ownership is considered to be a less than significant impact. No measures to minimize adverse effects are necessary or recommended for the Preferred Action.

4.4.2.2 No Development Alternative

As with the Preferred Action, the conversion of 118,650 acres of land in private ownership to the public domain would represent an effect on approximately 0.7 percent of existing privately owned land in the ROI. Under the Preferred Action, however, some of the 118,650 acres of land authorized for the modified Mitigation Project could potentially be publicly owned land that is made available to the Corps for terrestrial or aquatic habitat development. However, under the No Development alternative, it is not anticipated that public agencies would transfer land to the Corps

for the modified Mitigation Project if habitat and ecosystem improvements for the property were not developed or constructed on the sites. The small percentage of land converted from private to public ownership would represent a less than significant adverse impact on land ownership in the ROI.

No measures to minimize adverse effects are necessary or recommended for the No Development alternative.

4.4.2.3 No Action

Under the No Action alternative, no land would be acquired from current landowners except for the remaining acreage to be acquired as previously authorized by WRDA86 or by other Federal or state programs. The original Mitigation Project was authorized to develop habitat on 18,200 acres of public lands. As of September 30, 2001, the Corps had developed 5,779 acres of public lands for habitat. Additional development of public and private land under the original Mitigation Project could occur. Under the No Action alternative of the modified Mitigation Project, there would be no acquisition of land and no impacts to land ownership would occur.

4.4.3 PRIME FARMLAND

Land use practices within the floodplain of the ROI are heavily dominated by agriculture. This analysis assumed all cropland protected by levees in the ROI is prime farmland, as indicated in Section 3.4.3. Potential effects to farmlands as a result of the Preferred Action, the No Development, and the No Action alternatives were evaluated.

4.4.3.1 Preferred Action

The locations of specific mitigation sites that would be acquired are not known. However, implementation of the Preferred Action would cause some changes to prime farmland within the floodplain of the ROI. The Preferred Action would acquire 118,650 acres for development of fish and wildlife habitat in the floodplain of the Lower Missouri River and tributaries.

Because prime farmland comprises approximately 708,000 acres of the approximately 2,069,000 acres in the ROI floodplain (Table 3.4-3), it is likely that prime farmland would be converted to fish and wildlife habitat. As indicated in Section 4.4.1.1, other land use categories likely to be affected include range, forest, wetland, water, and barren land. The amount of land

to be acquired under any given land use is unknown.

The prime farmlands in the Missouri River floodplain were created by past flooding events carrying sediments rich in nutrients. The redeposition of new sediments has been inhibited by flood control and protection of the lands. What were once wetlands and shallow water habitat have transitioned into agricultural land protected from flooding and erosion. Environmental impacts associated with conversion of prime farmlands to wetland and shallow water and riparian habitats are beneficial in the long-term for the floodplain ecosystem. Water quality from runoff would be improved because there would be less runoff and the runoff that would occur would have less sediment and nutrient loading. Habitat for fish and wildlife that had been lost from past flood protection would be created or restored. Further details of beneficial environmental impacts are provided in Sections 4.2, 4.3, and 4.9.

It was assumed that all cropland within the floodplain that is protected by levees would be considered prime farmland. Approximately 34 percent (708,615 acres) of the floodplain is considered prime farmland based on the estimated amount of levee-

protected cropland in the floodplain (Table 3.4-3). Assuming that the same proportion of prime farmland in the ROI floodplain could be affected by the acquisition and conversion of 118,650 acres, approximately 40,600 acres of prime farmland (5.7 percent of existing prime farmland) could be removed from production. This is less than the total estimated cropland that would be affected because all cropland is not considered prime farmland. This is considered the maximum extent of impact because it was assumed that all land within the levees is prime farmland. The potential loss of prime farmland is considered to be less than significant.

Conversion would return the farmlands to a previous use, but the loss of prime farmland would reduce revenue for landowners and the county tax base; this impact is discussed in Section 4.5.2, Taxes.

Measures to reduce the socioeconomic impact of a loss in prime farmlands are addressed in Section 4.5.5. Acquisition of prime farmland sites would be avoided if possible. No other measures to minimize adverse effects on prime farmland are necessary or recommended as a result of the Preferred Action.

4.4.3.2 No Development Alternative

Effects of the No Development alternative are expected to be similar to the Preferred Action, representing a less than significant adverse impact on prime farmland. However, because existing public land is not anticipated to be used for the modified Mitigation Project under the No Development alternative, there would be the potential for a slightly higher percentage of privately owned prime farmland to be converted to wildlife habitat than may occur under the Preferred Action.

No measures to minimize adverse effects are necessary or recommended for the No Development alternative.

4.4.3.3 No Action

Under the No Action alternative, no prime farmland would be acquired and converted to fish and wildlife habitat, except for the remaining acreage to be acquired as previously authorized by WRDA86 or other Federal or state programs. Therefore, no impacts to prime farmland would occur under the No Action alternative.

4.4.4 ACCESS AND RECREATION

Land within the floodplain of the ROI is nearly all privately owned. The availability

of public recreation sites with river frontage and resulting access to the river is currently limited with approximately one site for every ten miles of river channel or a total of 74 facilities. Approximately one-third of the public access locations have boat-launching facilities of which some have limited improvements suitable for only small boats. Most of the public access to the river consists of walking from a park or unimproved wildlife area to the river. Public recreation facilities along the river provide opportunities for fishing, hiking, biking, camping, picnicking, wildlife observation, and other sites of historical interest. Potential effects on access and recreation from the Preferred Action, No Development, and the No Action alternatives are considered.

4.4.4.1 Preferred Action

The modified Mitigation Project would acquire 118,650 acres for development of fish and wildlife habitat in the floodplain of the Lower Missouri River and tributaries. Although the Corps will not be spending funds on recreation related features and facilities, the Preferred Action would provide an indirect beneficial impact with increased access to the Missouri River for recreation users. As shown in Table 4.4-3, based on a year 2000 survey of recreation users

**Table 4.4-3
Obstacles to Enjoyment of Outdoor Activities**

Obstacle	1994	1995	1996	1997	2000
	Percent of Respondents				
Lack of Time	38	30	40	34	33
Lack of Money	4	5	5	5	5
Proximity to Recreation Areas	5	6	5	4	8
Health	--	--	--	4	5
Age	1	3	2	3	4
Weather	--	--	--	3	3
Job/Work	2	1	2	2	--

-- Means less than 2 percent mentioned

Source: Missouri's 2000 Conservation Monitor Survey: The Gallup Report Missouri Department of Conservation Public Profile 2-2000.

(MDC, 2000), the lack of access (proximity to hunting, fishing, and boating areas) was cited by 8 percent of the respondents as one of the major obstacles to enjoying outdoor activities. Lack of time was mentioned as the greatest deterrent by 33 percent of the respondents, and lack of money was listed by 5 percent of the respondents.

Sites acquired for the original Mitigation Project range in size from hundreds of acres to several thousand acres. This range of site sizes would also likely occur with the Preferred Action, however, the locations of specific mitigation sites (and their numbers and sizes) that would be acquired are not known.

The creation of more public lands within the floodplain would increase access to the

Missouri River and floodplain. For purposes of this analysis, it was assumed that the mitigation sites would be three sizes (i.e., 1,000, 2,000, and 3,000 acres) and would be acquired proportionately in each state and region as was discussed in Sections 4.4.1 and 4.4.2, Land Use, and Land Ownership, respectively. The distribution of acres by state and region in this analysis is for comparative purposes only. WRDA99 does not require a particular allocation of acres. Given the Corps' preference for purchasing lands from willing sellers rather than establishing land acquisition goals for any state, region, or county, it is highly unlikely that there would be a concentration of acquired lands in any area that would significantly alter the outcome of this analysis. For a conservative estimate, it was also assumed that each new mitigation site would

Table 4.4-4**Access and Recreation Change in ROI**

	Iowa	Kansas	Missouri	Nebraska	ROI
Existing Number of Sites ¹	8	3	57	6	74
Percent of Riverbank Miles	11.9	7.8	63.8	16.5	100.0
Land to be Acquired (acres) ²	14,120	9,280	75,717	19,533	118,650
Number of New Sites ³	9	5	42	11	67
Total Future Sites	17	8	99	17	141
Percent Increase	112.5	166.7	73.7	183.3	90.5
	Region 1	Region 2	Region 3	Region 4	ROI
Existing Number of Sites ¹	7	30	18	19	74
Percent of Riverbank Miles	17.2	36.6	27.1	19.1	100.0
Land to be Acquired (acres) ²	20,408	43,426	32,154	22,662	118,650
Number of New Sites ³	12	24	18	13	67
Total Future Sites	19	54	36	32	141
Percent Increase	165.5	80.9	101.5	67.8	90.5

¹ USGS, Columbia Environmental Research Center, 2000

² Assumes land acquisition will be proportioned based on riverbank miles as discussed in text.

³ Assumes 30 1,000-acre sites, 22 2,000-acre sites and 15 3,000-acre sites.

represent only one access location. Large sites could provide more access locations. Table 4.4-4 summarizes the anticipated effect on access and recreation as a result of the Preferred Action. Overall, the ROI would experience over a 90 percent increase in access opportunities. Nebraska would experience the most at approximately 180 percent increase and Missouri would experience the least increase at approximately 74 percent increase. These differences are primarily because of the relative number of existing access locations in the two states.

Nebraska has only six public access locations while Missouri has 57. When considering the effects by region, Region 1 would experience an increase of approximately 165 percent and Region 4 would experience slightly less than a 68 percent increase in access opportunities. Again, this range is primarily because of the relative number of existing access locations in the two regions.

The increased number of mitigation sites would have significant social and economic benefits by increasing opportunities for the

major users along the Missouri River and its floodplain. Surveys show that hunting accounts for 4 percent, boating accounts for 10 percent, general other activities account for 19 percent, sight seeing/leisure time accounts for 33 percent, and fishing represents 35 percent of visits to the Missouri River (MDC, 1992). An increased number of access locations along the Missouri River would also benefit local users by decreasing the distance people would have to travel. Previous surveys demonstrated that between 22 percent and 43 percent of Missouri River recreational users travel less than five miles to use the Missouri River for recreational purposes (MDC, 1990).

It is possible that some private access points to the Missouri River could be lost by the acquisition of lands and conversion to wetlands and shallow water habitats. Recreational activities on private lands would experience a less than significant decrease from acquisition of private lands and conversion to public property; however, this would likely be minimal compared to the increase in recreation opportunities on public land. Fishing opportunities within the floodplain would increase and improve in quality. The Preferred Action would result in significant positive impacts to access and

recreation in the ROI. The negligible affect on existing private land access and recreation would be less than significant compared to the magnitude of new access and recreational opportunities that would occur from the Preferred Action.

No measures are necessary to minimize adverse effects of the Preferred Action. However, since the Katy Trail and numerous other public facilities already provide public access for recreation, future acquisition and development of mitigation sites should be done in such a manner that would not disturb the existing facilities or their recreational use. Future site selection should also include considerations for minimizing the acquisition of sites that would eliminate access and recreation at private or commercial facilities used by multiple individuals, groups, or club members. During development of the site-specific DPRs, environmental review would consider the potential effect on existing recreational facilities and opportunities.

4.4.4.2 No Development Alternative

As with the Preferred Action, the Corps would not construct recreational facilities at the mitigation sites. However, the purchase of 118,650 acres of land along the Missouri River for habitat would result in increased

land for recreational use and increase the number of access locations in the ROI floodplain from the current number of 74 to an estimated 141. This would represent a significant beneficial impact to the ROI and would be similar to the Preferred Action. The restoration of aquatic and terrestrial habitat under the Preferred Action, however, would provide a more diverse recreational opportunity than would be the case with the No Development alternative. Under the No Development alternative, the terrestrial habitat would be developed without a specific plan and may require a longer time for development on individual sites. Therefore, benefits to recreational opportunities that are tied to certain terrestrial habitats, such as wetlands or bottomland forest, may not be realized for a longer period of time than with the Preferred Action.

No measures to minimize adverse effects are necessary or recommended for the No Development alternative.

4.4.4.3 No Action

Under the No Action alternative, no land would be acquired for conversion to fish and wildlife habitat, except for the remaining acreage to be acquired as previously authorized by WRDA86 or by

other Federal or state programs. Therefore, beneficial impacts of increased access and recreational opportunities would not be provided. Recreational opportunities are dependent on a diverse Missouri River ecosystem. The No Action alternative would result in a significant adverse impact to floodplain access/recreation because the loss of recreational opportunities caused by the BSNP would continue.

4.5 SOCIOECONOMIC RESOURCES

Socioeconomic impacts as a result of the purchase of 118,650 acres will include both beneficial and adverse impacts to local economies and communities within the 46-county ROI. Potential beneficial impacts would include an increase in recreational opportunities from the mitigation sites generating long-term income for the region; and additional income and employment would be experienced from construction, monitoring, and operation of the mitigation sites. Adverse impacts would include a potential for a decrease in the tax base for individual counties, a potential increase in the tax rates paid by members of levee and drainage districts, and the potential for environmental justice impacts on lower income and disadvantaged populations located in the Missouri River ROI, as

discussed in Section 4.5.4, Environmental Justice. Another potential adverse impact could be reduced land in agricultural production, however, it should be noted that numerous governmental programs exist to remove land from cultivation.

The location of specific mitigation sites has not been determined at this time. However, for purposes of this analysis, lands to be acquired by the Preferred Action were distributed to individual counties base on the proportion of riverbank miles in each county. The socioeconomic analysis identified economic strengths and weaknesses of counties in the ROI based on the level of economic diversity, unemployment trends, and other factors that provide a baseline for evaluating potential impacts from implementing the modified Mitigation Project.

4.5.1 AGRICULTURE

Potential economic impacts to the agricultural sector that could result from the conversion of agricultural land to conservation use also includes impacts to third parties such as businesses that provide goods and services to the agricultural sector. Table 4.5-1 lists the basic assumptions of the analysis of agricultural productivity.

4.5.1.1 Preferred Action

For purposes of this analysis, Table 4.5-2 shows an estimate of the distribution of the modified Mitigation Project's 118,650 acres among the four states and selected ROI counties. The estimate of potential mitigation site acres purchased in any given political jurisdiction was based on a percent to total analysis of the proportion of 1,470 riverbank miles (735 river miles) currently

Table 4.5-1
Agricultural Impact Analysis Assumptions

- The modified Mitigation Project land would be distributed for purpose of impact analysis based on the portion of 1,470 riverbank miles (735 river miles) in each state or county in the ROI.
- The 118,650 acres of land purchased would consist of 76.3 percent cropland based on land use surveys in the Missouri River floodplain.¹
- A planting ratio of 50 percent for corn and soybeans was used in estimating the value of production for cropland lost.
- For purposes of agricultural impacts, 150 bushels for corn and 45 bushels for soybeans per acre were used for estimating losses in agricultural production.
- Prices for corn of \$1.95 and for soybeans of \$4.50 per bushel were used based on a year 2001 average for estimating the dollar values of crop production.²

¹ USGS, Columbia Environmental Research Center, 2001

² USDA Commodity Credit Corporation, Kansas City, Missouri, February 2002.

Table 4.5-2
ROI and Selected Counties - Impacts on Cropland and Agricultural Products Sold

State/ROI Counties	Riverbank Miles	Riverbank Miles (Percent of Total)	Potential Acres Acquired ¹	Potential Cropland Impacts ²	Total Cropland in State/County	Cropland Lost (Percent of Total)	Total Lost Corn and Soybean Crop Value	Value of Farm Products Sold	Percent of Total Farm Products Sold
Iowa 6 Counties	175	11.90	14,120	10,774	2,042,392	0.53	\$2,667,400	\$702,235,000	0.38
Kansas 5 Counties	115	7.82	9,280	7,081	762,129	0.93	\$1,752,863	\$200,158,000	0.88
Missouri 25 Counties	938	63.81	75,717	57,772	4,482,828	1.29	\$14,297,266	\$1,166,116,000	1.23
Nebraska 10 Counties	242	16.46	19,533	14,904	1,906,282	0.78	\$3,688,634	\$658,578,000	0.56
Total ROI	1,470	100.00	118,650	90,530	9,193,631	0.98	\$22,406,163	\$2,727,087,000	0.82
Selected Rural Counties With Highest Impacts in Each State									
State/ROI Counties	Riverbank Miles	Riverbank Miles (Percent of Total)	Potential Acres Acquired ¹	Potential Cropland Impacts ²	Total Cropland in State/County	Cropland Lost (Percent of Total)	Total Lost Corn and Soybean Crop Value	Value of Farm Products Sold	Percent of Total Farm Products Sold
Doniphan, Kansas	59	4.03	4,779	3,646	174,290	2.09	\$902,388	\$47,107,000	1.92
Cole, Missouri	32	2.20	2,612	1,993	97,564	2.04	\$493,280	\$26,464,000	1.86
Holt, Missouri	52	3.56	4,230	3,227	204,136	1.58	\$798,734	\$53,269,000	1.50
Howard, Missouri	40	2.73	3,239	2,472	158,770	1.56	\$611,743	\$52,827,000	1.16
Saline, Missouri	72	4.91	5,823	4,443	347,163	1.28	\$1,099,605	\$102,633,000	1.07
Nemaha, Nebraska	35	2.40	2,848	2,173	201,597	1.08	\$537,818	\$56,089,000	0.96
Harrison, Iowa	35	2.40	2,848	2,173	342,113	0.63	\$537,818	\$112,981,000	0.48

¹ Assumed land acquisition distribution based on riverbank miles as discussed in text.

² Assumed 76.3 percent of floodplain is cropland.

Note: Nemaha County, Nebraska and Harrison County, Iowa both had 35 miles of riverbank in their county.

Two Missouri counties that are not shown were predicted to have higher impacts than the one Nebraska county shown. Also, one Kansas county, three Nebraska counties, and five Missouri counties that are not shown were predicted to have higher economic impacts than the highest Iowa county.

Source: US Census Bureau: Census of Agriculture 1997

located in a state or ROI county. However, WRDA99 does not require a particular allocation of acres. Given the Corps' preference for purchasing lands from willing sellers rather than establishing land acquisition goals for any state, region, or county, it is highly unlikely that there would be a concentration of acquired lands in any area that would significantly alter the outcome of this analysis. Based on this method of allocating the modified Mitigation Project land, the State of Missouri with 64 percent of the riverbank miles could potentially realize the largest share of mitigation land with approximately 75,700 acres located in 25 ROI counties. Based on the assumption that 76.3 percent of the 75,700 acres of floodplain land is cropland, Missouri could lose up to 58,000 acres of cropland. However, some amount of cropland could be incorporated into management of mitigation sites, such as food plots. This estimated maximum of 58,000 acres would represent 1.3 percent of the cropland currently farmed in the 25 ROI counties in Missouri. Loss of cropland in the Iowa, Kansas, and Nebraska ROI counties, as a percent of total cropland, would be less than one percent.

The value of the crop production that would be lost in the ROI as a result of converting

118,650 acres (90,530 acres of cropland) of agricultural land for conservation purposes was estimated at approximately \$22 million annually, which would represent less than 1 percent of the value of agricultural products sold in the ROI.

The 25 rural non-MSA counties were analyzed using the riverbank mile approach previously discussed to distribute future land acquisition and to identify counties that could potentially experience, on a percentage basis, the highest loss of cropland. This analysis identified seven counties that could experience a slightly higher relative loss of cropland than other counties in their respective states, either because they had a relatively high number of riverbank miles or a relatively smaller cropland base in the county. As shown in Table 4.5-2 and based on this analysis, these seven counties could lose from 0.63 percent to 2.09 percent of their existing cropland base. This loss of cropland would result in a decline in corn and soybean revenue from approximately \$490,000 to \$1.1 million annually, representing between 0.48 and 1.92 percent of total farm products sold in the respective counties. Table 4.5-2 shows the Nebraska and Iowa counties that were predicted to have the highest potential

economic impacts from lost crop production in those states.

The conversion of cropland to conservation use would also have third party impacts on retail business that serve the agricultural sector and the local communities. The rural counties experiencing the highest losses of farmland and cropland, on a percentage basis, were used to estimate the potential impact on local agricultural retail businesses from the loss of farm production units. As shown in Table 4.5-3 and based on an average of 465 acres per farming unit, a county with a conversion of approximately 2,500 acres to conservation land would experience a loss of five farm units and a county with a conversion of 5,800 acres would potentially lose 13 farm

units. Average farm production expenses were \$58,600 per farm for the ROI (U.S. Census Bureau, 1997) that would result in an estimated reduction of farm purchases of between approximately \$290,000 to over \$760,000 annually in the local economy. As a percent of retail sales in the respective counties, this potential loss of farm purchases on a percentage basis would represent less than 1.66 percent of total retail sales for the highest impacted county and 0.05 percent for the lowest.

The analysis of quantifiable impacts resulting from the conversion of farmland to conservation land for mitigation sites would result in a loss of cropland of less than one percent of the ROI. The estimated loss of the value of agricultural products sold and

**Table 4.5-3
Estimated Farm and Retail Sales Impacts**

Selected ROI Counties with Potential High Economic Impacts	Potential Acres Acquired ¹	Farming Units Lost ²	Decrease in Farm Production Expenses ³	County Retail Sales	Potential Percent of County Retail Sales Lost
Doniphan, Kansas	4,779	10	\$586,000	\$43,230,000	1.36
Cole, Missouri	2,612	6	\$351,600	\$764,052,000	0.05
Holt, Missouri	4,230	9	\$527,400	\$39,387,000	1.34
Howard, Missouri	3,239	7	\$410,200	\$24,770,000	1.66
Saline, Missouri	5,823	13	\$761,800	\$140,929,000	0.54
Nemaha, Nebraska	2,848	6	\$351,600	\$51,498,000	0.68
Monona, Iowa	2,549	5	\$293,000	\$95,360,000	0.31

¹ Assumed land acquisition distribution based on riverbank miles as discussed in text.

² Assumes farming units of 465 acres based on ROI average farming unit size.

³ ROI average farm production expenses \$58,600 based on Census of Agriculture, 1997

Note: ROI average for farming unit size and production expenses were used to determine potential retail sales impacts.

Average farm size and production expenses is not available for Missouri River floodplain farms.

Source: US Census Bureau: Census of Retail Trade and Census of Agriculture 1997

retail sales in the counties were also a very small percentage of the total for these economic indicators. Based on this analysis, impacts to the agricultural sector are expected to be less than significant.

In addition to analyzing potential quantifiable impacts on the agricultural sector from the Preferred Action, there are also certain qualitative impacts to be considered. Farming operations may be impacted from the location of conservation sites adjacent to their property from additional weed control, increased foraging by wildlife on cropland, trespassing on farmland from hunters and recreation users of the mitigation sites, and a potential increase in groundwater levels from adjacent aquatic habitat sites that may impact spring crop planting or harvesting activities as was discussed in Section 4.2.2, Groundwater Hydrology. These impacts are also anticipated to be less than significant and would be addressed through proper design during development of site specific DPRs and by management of the mitigation sites.

The following measures were identified that could minimize potential impacts on landowners associated with the Preferred Action. The acquisition of parcels for

purchase and development of individual mitigation sites may take several years. During this time period, the land could remain in crop production until the total parcel has been acquired and a site development and management plan has been developed. Management of the mitigation site would be required to follow all local ordinances regarding noxious weed control and other land use restrictions. Proper signage identifying the boundaries of the mitigation site, combined with coordination with local landowners and public officials regarding the use of the mitigation site, would help alleviate some of the potential problems related to trespassing on adjacent properties.

4.5.1.2 No Development Alternative

As with the Preferred Action, the No Development alternative would result in the acquisition of 118,650 acres of primarily privately owned agricultural land for conversion to public natural resource use. Based on an estimate of 76.3 percent of floodplain agricultural land being classified as cropland, an estimated 90,530 acres would be removed from agricultural cropland production. The loss of 90,530 acres of cropland represents less than 1 percent of total cropland in the ROI. Because it was assumed that all of the

118,650 acres of mitigation land under the No Development alternative would come from privately owned agricultural land, there would be the potential for a slightly higher impact from this alternative compared to the Preferred Action. Under the Preferred Action, it was assumed that some of the mitigation land could potentially be non-agricultural land obtained from public agencies. The No Development alternative would have a less than significant adverse impact on agriculture and would be very similar to the discussion of agricultural impacts for the Preferred Action.

The presence of mitigation sites totally devoted to terrestrial habitat, and not having between 7,000 to 20,000 acres of aquatic habitat as proposed under the Preferred Action, would not represent a significant change in impacts to agricultural properties located adjacent to mitigation sites compared to the Preferred Action. Sites with aquatic habitat may attract more visitors to a specific mitigation site; however, this would depend on individual site characteristics and the location of the mitigation site. Allowing terrestrial habitat to develop without a specific plan for planting bottomland forest and other natural species as proposed under the Preferred Action would also not represent a

measurable difference in adverse mitigation site impacts to the adjacent agricultural properties between these two alternatives.

Because impacts are determined to be less than significant, no measures to minimize adverse effects are necessary or recommended for the No Development alternative.

4.5.1.3 No Action

Under the No Action alternative there would be no land purchased for the modified Mitigation Project and consequently there would be no impacts to the agricultural sector, although other Federal or state programs could acquire land and affect the agricultural sector.

4.5.2 TAXES

The potential impacts on individual county tax bases in the 46-county ROI was estimated to determine the level of impacts that could be anticipated from the purchase of land as part of the modified Mitigation Project. The methodology for tax base analysis included several steps and assumptions as presented in Table 4.5-4. The distribution of acres by county, state, and region in this analysis is for comparison

Table 4.5-4
Tax Base Impact Analysis Assumptions

- The mitigation land would be distributed for purpose of impact analysis based on the portion of 1,470 riverbank miles in each county in the ROI as discussed in the text.
- The land purchased in the floodplain would be agricultural land and assumes 76.3 percent would be in cropland based on a detailed USGS land use analysis of the river basin floodplain
- Average per acre tax rates for counties in individual states would be \$18.00 for Iowa, \$12.00 for Kansas, \$3.00 for Missouri, and \$14.50 for Nebraska. Information based on selected interviews with landowners and county assessor offices (HDR, 2002).
- Tax revenues generated by individual counties based on the US Census Bureau: Government Finance Statistics, 1997.

purposes only. WRDA99 does not require a particular allocation of acres. Given the Corps' preference for purchasing lands from willing sellers rather than establishing land acquisition goals for any state, region, or county, it is highly unlikely that there would be a concentration of acquired lands in any area that would significantly alter the outcome of this analysis.

4.5.2.1 Preferred Action

Impacts to the tax structures in the individual 46 counties in the ROI would result from the purchase of land for the Preferred Action. The purchase of the habitat restoration sites would result in the removal of agricultural land from the tax rolls, resulting in a loss of tax revenue to that county. As shown in Table 4.5-5, the ten counties with the highest potential for tax base impacts could potentially lose between approximately \$32,000 and

\$57,000 annually in gross tax revenue. The counties with high tax loss impacts would be expected to have relatively large parcels of land being converted to conservation use. The counties with high tax impacts also had higher tax rates ranging from \$12.00 to \$18.00 in Iowa, Kansas, and Nebraska, which created higher tax losses (HDR, 2002). Counties with expected lower losses in tax revenue were estimated to lose less land of between approximately 700 and 2,700 acres resulting in gross tax losses of approximately \$2,200 to \$8,200 in tax revenues annually. Counties with relatively lower tax losses were also located in Missouri, where property taxes are lower with a reported average of \$3.00 per acre (HDR, 2002). The net tax loss is slightly less for individual counties, reflecting the PILT of an estimated \$0.72 per acre paid by the Federal government to compensate, in part, for the tax base loss.

Table 4.5-5**Estimated Potential Tax Impacts from Mitigation Land Purchases**

Counties with Relatively High Tax Impacts	Potential Acres Acquired ¹	Assumed Real Estate Taxes per Acre	Estimated Lost Tax Revenue	Potential Net Loss After PILT ²
Doniphan, Kansas	4,779	\$12.00	\$57,342	\$53,902
Harrison, Iowa	2,808	\$18.00	\$50,549	\$48,527
Pottawattamie, Iowa	2,599	\$18.00	\$46,780	\$44,909
Monona, Iowa	2,549	\$18.00	\$45,889	\$44,054
Woodbury, Iowa	2,502	\$18.00	\$45,030	\$43,229
Nemaha, Nebraska	2,848	\$14.50	\$41,299	\$39,249
Burt, Nebraska	2,699	\$14.50	\$39,130	\$37,187
Fremont, Iowa	2,067	\$18.00	\$37,211	\$35,723
Washington, Nebraska	2,480	\$14.50	\$35,959	\$34,173
Richardson, Nebraska	2,214	\$14.50	\$32,097	\$30,503
Counties with Relatively Low Tax Impacts				
Andrew, Missouri	733	\$3.00	\$2,199	\$1,671
Montgomery, Missouri	1,128	\$3.00	\$3,383	\$2,571
Moniteau, Missouri	1,323	\$3.00	\$3,968	\$3,016
Gasconade, Missouri	1,376	\$3.00	\$4,128	\$3,137
Osage, Missouri	1,683	\$3.00	\$5,050	\$3,838
Chariton, Missouri	1,758	\$3.00	\$5,274	\$4,008
Cooper, Missouri	2,409	\$3.00	\$7,226	\$5,492
Warren, Missouri	2,516	\$3.00	\$7,548	\$5,736
Cole, Missouri	2,612	\$3.00	\$7,836	\$5,956
Buchanan, Missouri	2,739	\$3.00	\$8,216	\$6,244

¹ Assumed land acquisition distribution based on riverbank miles as discussed in text.

² PILT assumed to be \$0.72 per acre (BLM, 1997).

Source: HDR Levee and Drainage District Interviews and Interviews with Selected County Assessor Offices, February 2002.

Table 4.5-6 shows the estimated net tax loss for the predicted high impacted MSA urban and rural counties in the ROI based on a percent of the tax revenue lost to total local tax revenues generated in the county. The net tax revenue lost reflects the estimated annual PILT that is paid by the

Federal government to compensate for tax base losses. The net tax loss in urban counties was estimated to represent less than 1 percent of total county tax revenues. Considered as a percent of total Federal, state, and local tax revenues, the estimated

Table 4.5-6
Estimated Potential Tax Impacts for Selected MSA Urban and Rural Counties

	Potential Acres Acquired ¹	Locally Generated County Tax Revenues \$(000) ²	Potential Net Loss in Tax Revenue ³	Percent of Locally Generated Tax Base Lost	Percent of Total Federal, State and Local Tax Revenue Lost
MSA Urban Counties					
Washington, Nebraska	2,480	\$3,571	\$34,173	0.96	0.70
Dakota, Nebraska	1,504	\$3,142	\$20,726	0.66	0.47
Cass, Nebraska	1,678	\$4,083	\$23,121	0.57	0.40
Lafayette, Missouri	4,212	\$2,978	\$9,603	0.32	0.23
Ray, Missouri	3,277	\$3,750	\$7,473	0.20	0.10
Rural Counties					
Thurston, Nebraska	1,587	\$890	\$21,870	2.46	1.46
Nemaha, Nebraska	2,848	\$1,639	\$39,249	2.39	1.18
Doniphan, Kansas	4,779	\$2,299	\$53,902	2.34	1.79
Burt, Nebraska	2,699	\$2,175	\$37,187	1.71	1.27
Carroll, Missouri	4,562	\$635	\$10,400	1.64	0.64

¹ Assumed land acquisition distribution based on riverbank miles as discussed in text.

² Reported tax revenue information not available for four Iowa counties and six Missouri counties in the Government Finances Report (U.S. Census Bureau, 1997).

³ Net loss in tax revenues is calculated based on a PILT payment of \$.72 per acre.

loss would be 0.7 percent or less of total urban county revenues. In rural non-MSA counties the tax base impact would be higher with losses of up to 2.5 percent of the county's local tax revenue base, and when all sources of revenue are considered the loss would be less than 1.8 percent. Based on this analysis and its assumptions, the tax impacts are estimated to be less than significant. Federal PILT funds would continue to be paid annually to minimize, in part, the adverse impacts to local tax bases. Additional measures to minimize adverse effects are not necessary.

4.5.2.2 No Development Alternative

Under the No Development alternative, it was assumed that all of the 118,650 acres that would be acquired would be privately owned lands. This land would be removed from the tax base, as would be the case with the Preferred Action. Although the Preferred Action could use public non-taxable land, the Preferred Action alternative analysis considered that at a maximum, 118,650 acres of privately owned agricultural land would be acquired. As was determined for the Preferred Action,

the No Development alternative would have a less than significant adverse impact on the local tax structure. The No Development alternative may have the potential to have a slightly higher impact on local tax bases because all of the mitigation land is expected to come from private property owners, while under the Preferred Action a portion of the mitigation land may come from the transfer of public lands that have already been removed from the tax base.

Because impacts were determined to be less than significant, no measures to minimize adverse effects are necessary or recommended for the No Development alternative.

4.5.2.3 No Action

Under the No Action alternative there would be no land purchased and consequently there would be no impacts to the tax base of the 46 counties in the ROI.

4.5.3 LEVEE AND DRAINAGE DISTRICTS

4.5.3.1 Preferred Action

A potential impact of the Preferred Action on levee and drainage districts could occur from the loss of revenue from land being transferred from a paying district member to

a unit of government if only a portion of the levee district were acquired. For comparison purposes, Table 4.5-7 shows the anticipated tax impact on remaining members of a levee district under two assumed scenarios. One scenario assumed that 20 percent of the land in the district was purchased for a mitigation site and the other assumed that 50 percent of the levee district land was acquired under the Preferred Action. The analysis also showed the level of impact for different sizes of districts ranging from 500 acres to 5,000 acres and with two different tax rates (i.e., \$2.00 and \$8.00 per acre). It was assumed that annual tax rates of \$2.00 per acre would be used for levee districts for maintenance activities and \$8.00 per acre was used to pay for maintenance and debt service for those levee districts with outstanding debt. This also assumed that the levee districts receive no part of the annual PILT payment.

For levee districts that would lose 20 percent of its tax base that assess members at \$2.00 per acre for general maintenance, the Preferred Action could result in a shift in levee assessment cost ranging from \$200 for a small 500-acre levee district that has 100 acres converted to conservation use up to \$2,000 for a

Table 4.5-7
Levee and Drainage District Potential Tax Effects

Scenario 1: 20 Percent of Levee District Purchased								
Acres in Levee / Drainage District	Current O&M Cost		Acres of District Purchased	Acres Remaining in District	Revenue Loss from Acres Purchased at Annual District Tax Rate		Additional Cost per Acre to Remaining District Members	
	\$2.00 per acre	\$8.00 per acre			\$2.00 per acre	\$8.00 per acre	\$2.00 per acre	\$8.00 per acre
500	\$1,000	\$4,000	100	400	\$200	\$800	\$0.50	\$2.00
1,000	\$2,000	\$8,000	200	800	\$400	\$1,600	\$0.50	\$2.00
2,000	\$4,000	\$16,000	400	1,600	\$800	\$3,200	\$0.50	\$2.00
5,000	\$10,000	\$40,000	1,000	4,000	\$2,000	\$8,000	\$0.50	\$2.00
Scenario 2: 50 Percent of Levee District Purchased								
Acres in Levee / Drainage District	Current O&M Cost		Acres of District Purchased	Acres Remaining in District	Revenue Loss from Acres Purchased at Annual District Tax Rate		Additional Cost per Acre to Remaining District Members	
	\$2.00 per acre	\$8.00 per acre			\$2.00 per acre	\$8.00 per acre	\$2.00 per acre	\$8.00 per acre
500	\$1,000	\$4,000	250	250	\$500	\$2,000	\$2.00	\$8.00
1,000	\$2,000	\$8,000	500	500	\$1,000	\$4,000	\$2.00	\$8.00
2,000	\$4,000	\$16,000	1,000	1,000	\$2,000	\$8,000	\$2.00	\$8.00
5,000	\$10,000	\$40,000	2,500	2,500	\$5,000	\$20,000	\$2.00	\$8.00

district of 5,000 acres that would lose 1,000 acres. This potential loss of tax base for remaining landowners would result in an increase of \$0.50 to \$2.00 per acre for the remaining landowners depending on whether the annual assessment for members was \$2.00 or \$8.00 per acre and assumes that the Corps would not change the configuration of the levee. For levee districts that would lose 20 percent of its tax base land with an annual tax payment of \$8.00 per acre, lost revenue could range

from \$800 for a 500-acre levee district up to \$8,000 for a 5,000-acre levee district.

Using this same approach, and assuming the Preferred Action would acquire 50 percent of the district's land, the annual additional cost would be \$2.00 per acre for the district member with only operation and maintenance costs, and an additional \$8.00 per acre for districts that are paying off debt. Based on this analysis, and particularly where 50 percent of a district's

land would be purchased for a mitigation site, there would be the potential for significant impacts to levee district revenue sources and adverse impacts on remaining landowners.

Levees and other flood control structures would be maintained by local entities, association funds, or private funds. In the event that a levee is damaged or breached by a flood event, Federal funds for levee repairs would still be available for Federal and qualifying non-Federal levees. Repairs to non-Federal levees enrolled in PL84-99 program would still be subject to a cost-benefit analysis. The presence of modified Mitigation Project lands (i.e., habitat) within a levee district could affect the value of benefits used in PL84-99 cost-benefit analysis. Most recently, cropland has had higher monetary value than land with fish and wildlife habitat; however, future values are subject to change and are currently unknown. Any project features constructed on the protected side of a levee would be included as benefits in future cost-benefit analysis. Potential measures to minimize adverse effects could involve limiting the amount of a levee or drainage district that would be acquired, acquire all land within the levee district if all members were willing sellers, or working with the district and

landowners to develop an agreeable levee realignment. In cases where a levee setback or realignment would be used, the levee district would benefit from decreased O&M expenditures for the new levee. Specific measures to minimize any adverse economic impact would be coordinated with the levee district during land acquisition and included in the DPR for each site. In addition, potential adverse impacts could be reduced if levee districts received a part of the annual PILT payment.

4.5.3.2 No Development Alternative

The impacts of the No Development alternative would be the same as for the Preferred Action with the potential to have a significant adverse impact on specific levee and drainage districts under specific conditions. Based on the impact analysis for the Preferred Action, it was determined that there could be the potential for significant adverse impacts to the district's revenue source and adverse impacts on remaining landowners, depending on the levee district involved and the amount of the district's land that would be acquired. Again, it was assumed that the levee districts receive no part of the annual PILT payment. Levees and other flood control structures would be maintained by local entities, association funds, or private funds.

In the event that a levee is damaged or breached by a flood event, Federal funds for levee repairs would still be available for Federal and qualifying non-Federal levees. Repairs to non-Federal levees enrolled in PL84-99 program would still be subject to a cost-benefit analysis. The presence of modified Mitigation Project lands (i.e., habitat) within a levee district could affect the cost-benefit analysis and reduce the potential for Federal funds for levee repairs. This is considered a significant adverse impact.

As with the Preferred Action, potential measures to minimize adverse impacts would be evaluated on a case-by-case basis and could involve limiting the amount of a levee or drainage district that would be acquired, or acquire all land within the levee district. In addition, potential adverse impacts could be reduced if levee districts received a part of the annual PILT payment.

4.5.3.3 No Action

Under the No Action alternative there would be no land purchased by the modified Mitigation Project, and consequently there would be no impacts to the levee and drainage districts tax base.

4.5.4 ENVIRONMENTAL JUSTICE

4.5.4.1 Preferred Action

As previously stated, economic impacts are expected to occur primarily in the rural non-MSA counties. Of the rural, non-MSA counties, only Thurston County, Nebraska had a minority population (54.5 percent) that exceeded the ROI average of 15.4 percent. Considering population below poverty level, 24 of the 25 rural counties exceeded the ROI average of 9.6 percent of the population below the poverty level. Thurston County had by far the highest percent at 30.9 percent of the population below the poverty level. Twenty-two of the 25 rural counties exceeded the ROI average of 13 percent of the population over 65 years of age. Because almost all of the rural counties were similar in socioeconomic characteristics, the Corps did not consider the Preferred Action would cause a disproportionate impact to the populations in the majority of these rural counties. However, Thurston County, Nebraska was the sole rural county that exceeded the ROI average for percent minority population, and at 30.9 percent of the population below the poverty level, this county was considered at risk of experiencing a disproportionate effect from the Preferred Action.

The potential impact could occur through a shift of tax burdens resulting from the purchase of land for sites in that county. An increase in tax burden on Thurston County's minority and relatively low-income residents could result in disproportionate impacts to these populations. It is not anticipated that the Corps would purchase any Tribal lands for the Preferred Action. However, for the purpose of analysis, it was assumed that based on riverbank miles, Thurston County could experience a conversion of 1,587 acres of land. If all of the acquired lands were currently taxed by Thurston County and the State of Nebraska, this could result in a loss of gross tax revenue of \$23,012 or \$21,870 after a PILT reimbursement. This would represent 2.46 percent of the County's \$890,000 revenue base. If this amount of taxable private land were available, this would represent a less than significant impact. However, because almost all of the floodplain is within the Omaha and Winnebago Reservations and taxable land would probably not be available for acquisition by the Preferred Action, no tax impacts are anticipated.

Measures to minimize adverse effects are not considered necessary. However, if the Corps were to acquire land in Thurston

County, Nebraska, it could consider using easements to lessen the impact to the tax base.

4.5.4.2 No Development Alternative

Thurston County, Nebraska was the only rural county that had a minority population that exceeded the ROI average and it had the highest percent below the poverty level as was discussed in Section 3.5.1, Population, and Section 4.5.4. The potential impact of the No Development alternative would be the same as discussed in Section 4.5.4.1 for the Preferred Action. Based on the analysis, no impacts to minority and low-income populations are anticipated from the purchase of mitigation land under the No Development alternative. No measures to minimize adverse effects are necessary or recommended for the No Development alternative.

4.5.4.3 No Action

Under the No Action alternative, the modified Mitigation Project would purchase no land, and consequently there would be no environmental justice impacts.

4.5.5 LOCAL ECONOMIC AND RECREATION IMPACTS

4.5.5.1 Preferred Action

Although no funds will be spent on recreation related features/facilities, implementation of the Preferred Action would result in local and regional income and employment economic benefits. As shown in Table 4.5-8, the total cost for the modified Mitigation Project including monitoring and evaluation, land acquisition, and engineering and construction is estimated to range from \$740 million to \$1.33 billion (Corps, 2002a). Local economies would potentially benefit from the expenditure of up to \$80 million for on-site monitoring and evaluation, and from the engineering and construction funds of up to \$900 million. Annual operations and maintenance (O&M) cost for the fully constructed 118,650-acre Mitigation Project is estimated initially to range from \$3 to \$5

million annually, subject to the availability of funds, with cost declining in future years as the habitat developed becomes more self-sustaining and adaptive management practices allow for more passive management of the individual sites.

Table 4.5-9 shows the potential beneficial economic impacts for mitigation sites ranging in size from 1,000 to 3,000 acres. Local O&M expenditures would have a high potential to impact the local economy. However, future O&M expenditures would be subject to the availability of funds. Site O&M expenditures would include land management activities such as habitat preservation, wetland and infiltration control, tree planting and weed control; and other work at the sites such as maintaining and repairing pumps, structures, fences, signs and roadways. Assuming sites of approximately 1,000 acres in size for the 118,650-acre Preferred Action, the O&M

**Table 4.5-8
Modified Mitigation Project Cost Estimate**

Expenditure Category	Preferred Action	No Development Alternative	No Action
Monitoring & Evaluation	\$45,000,000 - \$80,000,000	\$45,000,000 - \$80,000,000	\$0
Land Acquisition	\$195,000,000 - \$350,000,000	\$195,000,000 - \$350,000,000	\$0
Engineering & Construction	\$500,000,000 - \$900,000,000	\$0	\$0
Total Estimate	\$740,000,000 - \$1,330,000,000	\$240,000,000 - \$430,000,000	\$0
Estimated Annual O&M Expenditures	\$3,000,000 - \$5,000,000	Undetermined	\$0

Source: US Army Corps of Engineers, Report to Congress, January 2002.

Table 4.5-9**Potential Local Economic Impact for Mitigation Sites****One-Time Project Expenditures**

Size of Site(s)	Engineering & Construction Expenditures Range (\$500 to \$900 Million)		Monitoring & Evaluation Expenditures Range (\$45 to 80 Million)		Total One-Time Expenditures Range		Annual O&M Expenditures	
1,000 acre Mitigation Site	\$4,217,075	\$7,585,335	\$379,267	\$674,252	\$4,596,342	\$8,265,587	\$25,284	\$42,141
2,000 acre Mitigation Site	\$8,428,150	\$15,170,670	\$758,534	\$1,348,504	\$9,186,684	\$16,519,174	\$50,569	\$84,282
3,000 acre Mitigation Site	\$12,642,225	\$22,756,005	\$1,137,800	\$2,024,756	\$13,780,025	\$24,778,761	\$75,853	\$126,422

Source: U.S. Army Corps of Engineers, Report to Congress, Corps 2002a.

cost expended in the local economy at each site would range from approximately \$25,000 to \$42,000 annually. For a county with 3,000 acres of mitigation sites, the annual O&M cost could reach up to \$126,000 per year. One-time expenditures for a 3,000-acre site could be as high as \$22.8 million for engineering and construction and up to \$2 million for monitoring and evaluation work on the site for several years after the site has been developed.

The Preferred Action would generate additional income to the local economy from the recreational use of the site. In a 1992 study, MDC estimated that fish and wildlife associated activities along the Missouri River accounted for annual expenditures of \$5.4 million, generating an

additional \$12 million in business activity, and supporting over 200 jobs (Brown, 1992). A landmark recreation user survey study directed by MDC identified the level of recreation use and estimated dollar value for recreation activities on the Missouri River over 553 miles from the mouth at St. Louis to the Missouri-Iowa state boundary (Fleener, 1989). The value for all recreation activities, including hunting, fishing, and non-consumptive activities such as sightseeing were estimated based on a travel cost model using net consumer surplus values. Using this study, the value of recreation on the Missouri River was estimated on a per acre value in 2001 dollars at \$40.60 per acre. Based on this approach, the annual dollar value for recreation use for a 1,000-acre mitigation site would be \$40,600 and approximately

\$121,800 for a site of up to 3,000 acres. Over the long-term, recreation development in the rural counties would also provide economic diversification for the rural agricultural based economy.

The Preferred Action would provide local economic benefit from construction, operations, monitoring, and by increased recreation. There would also be potential for long-term benefits due to an increase in tourism as a result of increased fish and wildlife habitat and recreational opportunities. No measures to minimize adverse effects are necessary.

4.5.5.2 No Development Alternative

Implementation of the No Development alternative would result in beneficial impacts to the local economy from the purchase and monitoring of mitigation sites and the increased opportunity for recreational use expenditures in the immediate area. These benefits, however, are anticipated to be less than forecasted under the Preferred Action because the No Development alternative would not include the \$500 to \$900 million allocated for engineering and construction. Therefore, construction induced spending in the ROI would not occur. The No Development alternative would also have a much lower

annual O&M expenditure than the \$3 to \$5 million allocated under the Preferred Action. Because no development would occur under this alternative, only minimal maintenance of the sites would be conducted.

4.5.5.3 No Action

Under the No Action alternative, no land would be purchased by the Preferred Action and consequently there would be no local economic benefits.

4.6 NATIVE AMERICAN RESOURCES

Native American resources include the land of the four reservations located along the Missouri River in the ROI and any unknown historic resources of Native Americans that may exist in the ROI floodplain. Also, Native Americans are a minority population and were considered in the environmental justice analysis in Section 4.5.4. The Tribal governments for these reservations are sovereign entities with rights to set their own laws and develop and manage Native American lands and other resources. The Tribal governments have the right to be involved in any Federal decisions or activities that could potentially affect these rights that have been established through treaties, Acts of Congress, and other

administrative actions.

4.6.1 PREFERRED ACTION

The Preferred Action would not purchase Tribal lands. However, the Corps would be willing to discuss other means such as easements to develop mitigation sites on Tribal lands. The development of sites under the Preferred Action would have less than significant adverse impacts to Tribal lands and resources because the Corps would not acquire these lands in fee title, although some beneficial impacts could result. The potential for impacts on Tribal lands would be similar as for adjacent farm operators in terms of trespassing from recreation users, increased foraging on cropland by wildlife, and the potential increase in groundwater levels should the site be developed into an aquatic habitat site. These potential impacts are considered less than significant. Beneficial impacts could result by increasing fish, wildlife, and vegetation resources important to Native American cultures, as well as increased opportunities for recreational and traditional activities. The sites for the construction of chutes or other mitigation structures will be evaluated in the next level of environmental review as part of DPR development including an analysis and inventory of existing or potential Native

American resources located on the site. Any significant impacts to Native American resources would be identified with measures developed to minimize adverse effects, or to provide monitoring of construction activities to ensure Native American resources would not be adversely impacted.

The Preferred Action would not impact the current plans of the Winnebago Tribe to operate a ferry service between the reservation lands in Nebraska to reservation lands in Iowa to provide access to the Tribal casino and to provide a more direct access to Interstate 29 in Iowa. The ferry was reported to provide an annual revenue of more than \$2 million and job opportunities from an estimated use of 800,000 vehicles annually (Corps, 2001). Location of mitigation sites near the ferry operation should not have adverse impacts on the ferry operation, and could potentially benefit the ferry operation as a result of attracting recreation users to the area, resulting in higher revenues.

The Preferred Action would comply with all treaty and other agreements established with the Federal government. Other potential impacts of the Preferred Action on the relatively high number of Native

Americans living in Thurston County, Nebraska are addressed in Section 4.5.4, Environmental Justice.

4.6.2 NO DEVELOPMENT ALTERNATIVE

The No Development alternative would not likely develop mitigation sites on Tribal lands. As with the Preferred Action, the No Development alternative would not impact the current plans of the Winnebago Tribe to operate a ferry service between the reservation lands in Nebraska to reservation lands in Iowa to provide access to the Tribal casino and to provide a more direct access to Interstate 29 in Iowa. Location of mitigation sites near the ferry operation would not have adverse impacts on the ferry operation, and could potentially benefit the ferry operation as a result of attracting recreation users to the area, resulting in higher revenues. The modified Mitigation Project would comply with all treaty and other agreements established with the Federal government in the implementation of the No Development alternative.

No measures to minimize adverse effects are necessary or recommended for the No Development alternative.

4.6.3 NO ACTION

Under the No Action alternative, no further mitigation of fish and wildlife habitat along the Lower Missouri River would occur with the exception of the remaining acreage authorized by WRDA86 or by other Federal or state programs. Because no new mitigation sites would be acquired and developed, no impacts to Native American resources within the ROI would occur.

4.7 NAVIGATION

Navigation on the Lower Missouri River was made possible by the BSNP and authorized by Congress by the RHA and amendments. The Corps is required to maintain a navigation channel nine-feet deep and 300-feet wide between Sioux City and the mouth at St. Louis. The navigation season is generally limited to the months of April through November.

The Preferred Action, No Development alternative, and No Action alternative were evaluated to determine potential impacts to Missouri River navigation that could result from each alternative. The potential affect on navigation was evaluated in the context of the types of construction that are generally proposed for a mitigation site.

4.7.1 PREFERRED ACTION

Construction of project features such as inlet structures, side channels and chutes to create shallow water habitat, and outlet structures may require modification of some dikes and revetments. Changes to these structures would be necessary to direct a certain volume of water away from the main channel. This will potentially slow down the flow of the river behind the structure and the effects would need to be monitored closely and dikes adjusted to ensure navigation is not impacted. The design phase of site development under the Preferred Action would include hydrologic modeling to ensure that design modifications of these structures would not adversely affect Missouri River channel morphology. The Preferred Action is not anticipated to impact navigation on the Lower Missouri River.

Development of specific mitigation sites would include evaluation and modeling of modification to existing structures and construction of new structures to avoid impacting the navigation channel. Beyond this detailed consideration for each mitigation site, measures to minimize adverse effects are not necessary because no impacts to navigation are anticipated.

4.7.2 NO DEVELOPMENT ALTERNATIVE

Under the No Development alternative, no chutes or side channels would be constructed; therefore no flow from the main channel would be diverted. No modifications to existing river structures associated with the Mitigation Project would be performed, however, modifications may continue under the O&M activities for the BSNP. The Corps is required to maintain the navigation channel between Sioux City and the mouth at St. Louis. The No Development alternative is not anticipated to impact navigation.

No measures to minimize adverse effects are necessary or recommended as a result of the No Development alternative.

4.7.3 NO ACTION

Under the No Action alternative, no development of fish and wildlife habitat would occur except for the 48,100 acres previously authorized by WRDA86. The Corps would continue its notch dike program as discussed in Section 1.5.4. Existing navigation conditions would remain unchanged.

4.8 CULTURAL RESOURCES

4.8.1 PREFERRED ACTION

Construction activities are anticipated to occur in the floodplains of the Missouri River and tributaries. Most of the Lower Missouri River floodplain has been in intensive agricultural production historically through the present. Therefore, any existing cultural resources within the floodplain likely have been damaged or destroyed through tree clearance, cultivation, chisel plowing (deep plowing), installation of drain tiles, and previous excavation for drainage, irrigation, or levee construction. Most intact cultural resources are anticipated to be very deeply buried or topographically above the floodplain (e.g., terraces and uplands adjacent to the floodplain), especially in the vicinity of tributary streams. Some cultural resources such as submerged riverboats may be present in the floodplain where the river channel historically occurred. Although potential mitigation sites have not been identified, it is possible that construction of the Preferred Action could adversely affect cultural resources. However, significant impacts are not anticipated.

Detailed environmental review on a site-by-site basis would be performed during DPR

development and prior to decision-making regarding development of each future mitigation site. The environmental review process will be in compliance with NEPA and Corps regulations, including Section 106 consultation with the appropriate SHPOs, Tribal Historical Preservation Officers (THPO), if required, and interested parties. It is anticipated that any cultural resources encountered would be avoided by construction activities, or appropriate measures to minimize adverse effects would be taken to protect the resource.

It is possible that presently undocumented cultural resources including Lewis and Clark sites now located on private lands could be acquired. When the land comes under Federal ownership, cultural resources on those lands become subject to several Federal historic preservation laws and regulations. Cultural resources would not be adversely affected by Federal acquisition of land, but they would receive increased protection by Federal laws. This is considered a beneficial impact.

Significant adverse impacts to cultural resources are not anticipated. If cultural resources are encountered during site development, avoidance of them would be attempted. If this is not possible,

appropriate measures to minimize adverse effects would be developed to protect the resource. Protection measures would be determined in consultation with the appropriate SHPOs, THPOs, and interested parties.

4.8.2 NO DEVELOPMENT ALTERNATIVE

Some beneficial impacts to cultural resources could occur as a result of land acquisition under the No Development alternative. There would be no construction activities under this alternative; therefore, there would be no potential for adverse impacts to cultural resources from such activities.

It is possible that presently undocumented cultural resources such as Lewis and Clark sites, other historic sites, or archaeological sites now located on private lands could be acquired. When the land comes under Federal ownership, cultural resources on those lands become subject to several Federal historic preservation laws and regulations. Cultural resources would not be adversely affected by Federal acquisition of land, but they would receive increased protection by Federal laws resulting in potential beneficial impacts.

No measures to minimize adverse effects are necessary or recommended as a result of the No Development alternative.

4.8.3 NO ACTION

The No Action alternative would not present potential impacts to cultural resources from construction of the modified Mitigation Project sites because no land would be acquired for fish and wildlife habitat development. However, the No Action alternative would not provide protection of cultural resources that are presently threatened under existing conditions, nor would it provide protection as required by Federal laws and regulations for lands under Federal ownership.

4.9 AIR QUALITY AND NOISE

4.9.1 AIR QUALITY

The potential air quality impacts of the modified Mitigation Project are discussed in this section in terms of short-term construction impacts and long-term operations impacts, meaning those after project implementation.

4.9.1.1 Preferred Action

Construction related air quality impacts would tend to be very localized and

obviously temporary in nature. Such impacts would be due to relatively minor amounts of combustion related emissions from vehicle engine exhausts, and fugitive dust from earthmoving operations. Most of the affected river-bottom land is currently farmed and, therefore, has these same types of emissions, but on a more “permanent” basis. Therefore, the construction related impacts are expected to be less than significant, especially in comparison to the current land use activities.

After implementation of the Preferred Action, there should be a net reduction in combustion related emissions, and in fugitive dust emissions related to farming operations such as tilling and harvesting. Thus, the Preferred Action is expected to have a positive, though minimal, long-term impact on air quality in the ROI, due to the elimination of farming related emissions on the affected land areas. The aquatic and terrestrial habitat created by the Preferred Action would consist of water or heavily vegetated surfaces, thus tending to create a “sink” for airborne fugitive dust, rather than being a source of such fugitive dust.

This analysis indicates that construction related air quality impacts would be less than significant and there would be a slight

long-term positive impact to ambient air quality, therefore, mitigation measures are not required. However, BMPs would be implemented during construction regarding equipment and fugitive dust emissions.

4.9.1.2 No Development Alternative

Under the No Development alternative, construction activities would not occur at the acquired mitigation sites. Therefore, there would be no construction-related air quality impacts as a result of the No Development alternative. After land acquisition under the No Development, there should be a net reduction in combustion related emissions, and in fugitive dust emissions related to farming operations such as tilling and harvesting. Thus, the No Development alternative is expected to have a positive, though minimal, long-term impact on air quality in the ROI, due to the elimination of farming related emissions on the affected land areas. The habitat restored by the No Development alternative would consist primarily of heavily vegetated surfaces, thus tending to create a “sink” for airborne fugitive dust, rather than being a source of such fugitive dust.

No measures to minimize adverse impacts are necessary or recommended as a result of the No Development alternative.

4.9.1.3 No Action

No Federal action to construct the modified Mitigation Project sites would have no effect on current ambient air quality. The negligible construction related air quality impacts would not occur. However, agricultural activities would continue at the mitigation sites and potential long-term decreases in fugitive dust emissions would not occur.

4.9.2 NOISE

4.9.2.1 Preferred Action

The principal source of noise in the ROI is from farming activities, motor vehicle traffic along major highways and at urban areas, and to a lesser extent from railroad traffic. Construction activities to develop habitat such as a side channel may require use of heavy earthmoving equipment. This equipment would produce some noise during construction. However, it is not anticipated that construction activities would increase noise levels beyond that typical of farming operations in the vicinity. Therefore, construction related noise

effects are anticipated to be less than significant.

After restoration of habitat at the modified Mitigation Project sites, the only noise anticipated to be generated from the Preferred Action would be from occasional recreational activities at the mitigation sites. The Preferred Action is not anticipated to generate discernable noise effects on sensitive receptors. The minimal noise generated from the Preferred Action during construction and after habitat development would be consistent with the land use in the vicinity of the mitigation sites, and are not anticipated to produce noise levels that would conflict with nearby land uses. Occasional noise generated from recreational activities was anticipated to be less than from current farming operations, and was considered to be a slight beneficial impact over the long-term.

Because adverse noise impacts are not anticipated, measures to minimize adverse effects are not necessary.

4.9.2.2 No Development Alternative

The principal source of noise in the ROI is from farming activities, motor vehicle traffic along major highways and at urban areas, and to a lesser extent from railroad traffic.

Under the No Development alternative, only land would be acquired. Construction activities would not occur; therefore, there would be no construction-related noise impacts.

After acquisition of the mitigation sites, habitat would be allowed to develop naturally without construction or other activities such as plantings. Therefore, the only noise anticipated to be generated from the No Development alternative would be from occasional recreational activities at the mitigation sites, however, this is anticipated to be minimal. The No Development alternative is not anticipated to generate discernable noise effects on sensitive receptors. The minimal noise generated from the No Development alternative would be consistent with the land use in the vicinity of the mitigation sites, and are not anticipated to produce noise levels that would conflict with nearby land uses. Occasional noise generated from recreational activities was anticipated to be less than from current farming operations, and was considered to be a slight beneficial impact over the long-term.

Because adverse noise impacts are not anticipated, measures to minimize adverse

noise effects are not necessary or recommended.

4.9.2.3 No Action

Because the modified Mitigation Project would not construct habitat or alter existing land use, minimal noise generation from earth moving equipment would not occur. Conversely, farmland would not be converted to habitat and existing ambient noise levels from farming operations would remain.

4.10 SOLID AND HAZARDOUS WASTE

As discussed previously, the location, areal extent, and type of restoration activities at particular locations are not known at this time. This SEIS is programmatic in nature and addresses potential impacts of the modified Mitigation Project, and does not evaluate potential impacts to specific solid and hazardous waste sites and facilities.

4.10.1 SOLID WASTE

Impacts to solid waste facilities could occur from modification of resources within the floodplain to improve wetland, shallow water habitat, and terrestrial habitat. It is more likely that impacts would be indirect because disturbance of permitted solid

waste facilities would be avoided when selecting areas for acquisition and modification.

4.10.1.1 Preferred Action

Acquisition of land for restoration of habitat would not likely affect solid waste facilities. Specific sites for acquisition and restoration have not been identified, but are anticipated to occur within the floodplain of the ROI. Because permitted solid waste facilities operate under specific constraints, acquisition of land for implementation of the Preferred Action would not likely occur if it would adversely affect the operation and management of a solid waste management facility. For example, placement of a wetland or shallow water habitat adjacent to a permitted landfill could raise the water table beneath the landfill and affect groundwater monitoring and other systems. Consequently, siting a mitigation or restoration project near permitted solid waste facilities would be avoided.

Areas within or adjacent to permitted solid waste facilities would be avoided due to the additional costs and precautions necessary to maintain operations and access. Selection of sites for different types of habitat restoration projects would be done using criteria to identify areas that would

minimize costs for modification and would minimize the potential for adverse impacts to adjacent lands. Therefore, this analysis indicates that there would be no impact to solid waste facilities from the Preferred Action.

No measures to minimize adverse effects are necessary or recommended for the Preferred Action. Measures to minimize adverse effects on permitted solid waste facilities may be considered at specific sites selected subsequent to the completion of the SEIS; these measures would be addressed in development of the DPR and subsequent NEPA documents on the specific activities planned at a particular site. If unknown solid waste is identified on an acquired parcel, measures to minimize adverse effects could include removal, proper handling, and disposal of small amounts of solid waste. The chance of uncovering a past burial site would be minimized through the Corps' environmental baseline survey process of identifying past owners and land use for a parcel of land prior to acquisition.

4.10.1.2 No Development Alternative

Acquisition of land under the No Development alternative would not likely

affect solid waste facilities. Siting a mitigation project near permitted solid waste facilities would be avoided. Areas within or adjacent to permitted solid waste facilities would be avoided due to the additional costs and precautions necessary to maintain operations and access. Therefore, there would be no impact to solid waste facilities from the No Development alternative.

No measures to minimize adverse effects are necessary or recommended for this alternative. If unknown solid waste is identified on an acquired parcel, measures to minimize adverse effects could include removal, proper handling, and disposal of small amounts of solid waste. The chance of uncovering a past burial site would be minimized through the Corps' environmental baseline survey process of identifying past owners and land use for a parcel of land prior to acquisition.

4.10.1.3 No Action

Under the No Action Alternative, activities associated with the original Mitigation Project would continue, as well as other Federal and state programs, but no new projects associated with the modified Mitigation Project would occur. Consequently, the potential for impacts to

solid waste facilities would be essentially the same. No significant impacts to proper management of solid waste would occur.

4.10.2 HAZARDOUS WASTE

Impacts to hazardous waste facilities and CERCLA sites could occur from modification of resources within the floodplain to improve habitat. It is more likely that impacts would be indirect because permitted hazardous waste facilities and CERCLA sites would be avoided when selecting areas for acquisition and development of habitat.

4.10.2.1 Preferred Action

Acquisition of land for the modified Mitigation Project to create habitat is not anticipated to directly affect hazardous waste facilities or CERCLA sites. Specific sites have not yet been identified, but would occur within the floodplain of the ROI. Because permitted hazardous waste facilities operate under specific constraints, acquisition of a licensed facility land for implementation of the Preferred Action would not occur.

Areas within or adjacent to permitted waste facilities would likely be avoided due to the additional costs and precautions necessary

to maintain operations and access. Selection of sites for different types of habitat restoration projects would be done using criteria to identify areas that would minimize costs for modification and would minimize the potential for adverse impacts to adjacent lands. Acquisition and development of land for the Preferred Action would not include the purchase of contaminated properties, such as hazardous waste facilities and CERCLA sites, therefore no impact is anticipated.

Measures to minimize adverse effects on permitted hazardous waste facilities may be considered at specific sites selected subsequent to the completion of the SEIS; these measures would be addressed in development of site specific DPRs and subsequent NEPA documents on the specific activities planned at a particular modified Mitigation Project site. If unknown buried hazardous waste on an acquired parcel was identified, measures to minimize adverse effects could include removal, proper handling, and disposal of small amounts of hazardous waste. The chance of uncovering a past burial site would be minimized through the Corps's environmental baseline survey process of identifying past owners and land use for a parcel of land prior to acquisition. No

further measures to minimize adverse effects are necessary or recommended for the Preferred Action.

4.10.2.2 No Development Alternative

Specific mitigation sites for acquisition have not yet been identified, but would occur within the floodplain of the ROI. Because permitted hazardous waste facilities operate under specific constraints, acquisition of a licensed facility land for implementation of the No Development alternative would not occur. Therefore, acquisition of land under the No Development alternative would not impact hazardous waste facilities or CERCLA sites.

Site selection and acquisition within or adjacent to permitted hazardous waste facilities or CERCLA sites for the No Development alternative would be avoided due to the additional costs and precautions necessary to maintain operations and access. Acquisition of land for the No Development alternative would not include the purchase of contaminated properties such as hazardous waste facilities and CERCLA sites; therefore, no impacts from this alternative are anticipated.

If unknown buried hazardous waste on an acquired parcel were identified, measures to minimize adverse effects could include removal, proper handling, and disposal of small amounts of hazardous waste. The chance of uncovering a past burial site would be minimized through the Corps's environmental baseline survey process of identifying past owners and land use for a parcel of land prior to acquisition. No further measures to minimize adverse effects are necessary or recommended for the No Development alternative.

4.10.2.3 No Action

Under the No Action alternative, original Mitigation Project activities would continue, but no activities of the modified Mitigation Project would occur. Consequently, the potential for impacts to licensed hazardous waste facilities and CERCLA sites would be essentially the same as currently exist. No impacts to proper management of hazardous waste would occur.

4.11 CUMULATIVE EFFECTS

4.11.1 INTRODUCTION

Cumulative effects can result from individually minor, but collectively significant actions taking place over a period of time.

Cumulative effects are the impacts on the environment that could result from the incremental effect of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. This SEIS analyzed the modified Mitigation Project in conjunction with other related past, present, and reasonably foreseeable future actions where impacts could potentially compound or interrelate with Mitigation Project activities.

There are potential beneficial and adverse cumulative effects that could occur as a result of implementing the modified Mitigation Project in converting 118,650 acres of primarily agricultural land in the ROI to conservation use. Consideration of potential cumulative effects are important because of other conservation and agricultural programs currently being implemented along the Missouri River including:

- WRDA86 original Mitigation Project – 48,100 acres,
- USFWS - Big Muddy NFWR – potentially 60,000 acres; Boyer Chute NWR – potentially 10,000 acres,
- Corps Section 1135 projects,

- Corps Section 206 projects,
- NRCS WRP and EWRP and,
- NRCS Conservation Reserve Program (CRP).

All of these programs have impacts to varying degrees on the local agricultural sector, local tax base, and rural economies as a result of removing agricultural land, either on a temporary or permanent basis. Conversely, there are also cumulative beneficial impacts to the river floodplain ecology, surrounding upland habitats, and economically as a result of increased access and recreational opportunities on the Missouri River.

4.11.2 LAND ACQUISITION EFFECTS

Completion of the original Mitigation Project would contribute cumulatively to the adverse and beneficial impacts identified for the modified Mitigation Project. As shown

in Table 4.11-1 the original Mitigation Project has currently acquired 30,693 acres of Missouri River floodplain land for fish and wildlife habitat development, and is authorized by Congress to develop an additional 17,407 acres consisting of 4,985 acres that will be acquired from private landowners and 12,422 acres to be obtained from existing public lands along the Missouri River.

The Big Muddy NFWR currently has six approved units totaling 6,845 acres located in eight counties along the Missouri River in the State of Missouri that have been purchased and committed to conservation land as shown in Table 4.11-2. The Big Muddy NFWR has been authorized to expand by an additional 53,155 acres. After completion of acquisition there would be a total of 60,000 acres in the Big Muddy NFWR. In addition, the USFWS plans to

**Table 4.11-1
Original Mitigation Project WRDA86 Acres**

State	Non-Public Land Acquired from Willing Sellers	Existing Public Land Easements/Licenses	Total Land in Original Mitigation Project
Iowa	3,291	2,396	5,687
Kansas	2,111	0	2,111
Missouri	12,498	3,331	15,829
Nebraska	7,015	50	7,065
Total Acquired	24,915	5,778	30,693
Acres to be Acquired	4,985	12,422	17,407
Total WRDA86 Program	29,900	18,200	48,100

Table 4.11-2 Big Muddy NFWR Approved Units		
Missouri Counties	Conservation Unit	Acres
Ray, Clay and Jackson	Jackass Bend	536.8
Saline and Lafayette	Cranberry Bend	552.6
Saline	Jameson Island	1,870.9
Howard	Lisbon Bottoms	2,013.6
Cooper	Overton Bottoms North	747.2
Osage	St. Aubert Island	1,124.0
Total		6,845.1

Source: USFWS, 2002.

expand the Boyer Chute NWR up to 10,000 acres. These developments would have positive impacts for fish and wildlife habitat in the river floodplain.

The potential cumulative effects of land acquisition should be considered in the context of the amount of privately owned land in the ROI, the purpose of the land acquisition, and the amount of habitat loss that is being mitigated. Table 4.11-3 summarizes the historic habitat lost in each state and the ROI by the BSNP, and compares that acreage with the various governmental land acquisition actions that have occurred and are planned in the ROI. A total of 114,550 acres of publicly owned land currently exists in the ROI, not including Tribal lands, DoD lands, or property owned by municipal and local governments. Assuming all planned projects will acquire the maximum acreage

authorized, a total of approximately 299,000 acres of government owned land would exist in the ROI in the future. This would represent only 1.8 percent of the total ROI land area and varies by state from 0.9 percent (Kansas) to 2.1 percent (Missouri). Based on this analysis it is determined that the acquisition of private agricultural land for conversion to public conservation use would have a less than significant cumulative impact.

4.11.3 ECONOMIC EFFECTS

The cumulative impact analysis indicates there would be a potential for an adverse impact on tax revenues for individual counties in the ROI that could result from the combined effects of the conversion of primarily privately owned agricultural land to publicly owned conservation land. This effect could result from the combined

effects of various governmental programs including WRP, CRP, BLM Entitlement Lands, Big Muddy NFWR, Boyer Chute NWR, and other Corps Section 1135 and 206 projects. Because the locations of the modified Mitigation Project sites are not known at this time, the determination of whether a significant cumulative impact would exist in a given county at any given site would be determined at the next level of environmental review, and appropriate mitigation of the significant impacts would be proposed at that time for individual counties and taxing jurisdictions.

The agricultural community could

experience a cumulative impact from the loss of cropland and the purchases made from local retail and service establishments that serve farm operators in the ROI. There should not be any cumulative impacts on the tax base from the Big Muddy NFWR because the USFWS provides revenue sharing payments to local governments that currently exceed the property taxes on the sites prior to conservation development.

Additional cumulative impacts to be considered include lost tax revenues from existing entitlement acres, WRP acres, and CRP lands. PILT entitlement lands (66,956 acres), WRP lands (60,788 acres), and

Table 4.11-3 Cumulative Land Effects in Acres					
	Iowa	Kansas	Missouri	Nebraska	ROI
Habitat Lost by BSNP	65,400	55,100	304,900	96,600	522,000
Existing Public Lands¹	26,907	2,172	70,028	15,443	114,550
Additional original Mit. Proj. Land to be Acquired²	3,909	239	702	135	4,985
Modified Mitigation Project³	14,120	9,280	75,717	19,533	118,650
Additional USFWS Refuge Land to be Acquired⁴	NA	NA	53,155	7,607	60,762
Total Future Public Lands	44,936	11,691	199,602	42,718	298,947
Future Private Lands in the ROI	2,639,172	1,286,609	9,382,871	2,705,997	16,014,649
Total Land in ROI⁴	2,684,108	1,298,300	9,582,473	2,748,715	16,313,596
Percent of ROI that would be Owned by Government	1.7	0.9	2.1	1.6	1.8

¹ Includes original Mitigation Project, Big Muddy NFWR, Boyer Chute NWR and various state-owned lands. (USGS, 2001)

² Corps, 2002.

³ Assumes land acquisition will be proportioned based on riverbank miles as discussed in text, and no public land used.

⁴ USGS, Columbia Environmental Research Center, 2001.

Note: Does not include land in government programs such as CRP, EWRP, and WRP that are not owned in fee title.

CRP lands (494,795 acres) have an effect on the tax base as these lands can potentially be taxed at a reduced rate. Table 4.11-4 summarizes the lands under other government programs that would affect the local tax base. Entitlement lands receive PILT funds to partially compensate counties for taxes lost as a result of taking land out of private ownership and off the tax roles of the county. An analysis of PILT payments indicates that generally the payments do not fully replace the tax revenues provided by private land ownership.

The WRP is a voluntary program to restore and protect wetlands on private property where farm owners may sell conservation easements or enter in a cost share agreement with USDA to restore and protect wetlands. Under this program the landowner limits use of the land while

retaining private ownership. The landowner has three basic options of permanent easement, 30-year easement, and restoration cost-share agreement for a minimum of a ten-year period. The WRP landowner may qualify for a reduced tax level with the change of land use from cropland to conservation use.

Farm retail and service business could also be impacted by these programs as a result of reduced purchases of seed, fertilizer, machinery, and other products and services required for cropland production. Similar cumulative effects could occur from the CRP program where approximately 495,000 acres have been set aside on a more temporary basis for conservation purposes that has reduced cropland acreage in ROI counties.

Table 4.11-4 Cumulative Tax and Economic Impacts				
	PILT Entitlement Acres¹	CRP (Acres - Oct. 2000)	WRP (Acres)	Total Acres
Iowa	2,208	72,976	11,108	86,292
Kansas	2,111	37,113	127	39,351
Missouri	51,042	268,812	41,655	361,509
Nebraska	11,595	115,844	7,898	127,439
ROI Total	66,956	494,745	60,788	622,489

¹ Includes land acquired by the Federal government by the original Mitigation Project

Source: State WRP Coordinators, BLM Entitlement Acres Database, and USDA CRP enrollment data (October 2000).

4.11.4 RECREATION EFFECTS

The acquisition of 118,650 acres by the modified Mitigation Project would increase the recreational attraction to the Missouri River floodplain, and cause more visitors that would generate increased vehicular traffic and more pedestrian traffic at mitigation sites than existed when the land was used for agricultural purposes. Other conservation and public use programs such as expansion of the Big Muddy NFWR and the Boyer Chute NWR would also increase recreation access locations and opportunities. The increase in public lands along the Missouri River would also provide more diverse recreation opportunities, thus increasing the overall appeal of the river and floodplain for local recreation users as well as attracting more long distance destination vacationers.

Construction associated with development of the sites would have less than significant adverse impacts. The impacts from conservation use of the floodplain, however are expected to be less than the existing adverse effects from the use of fertilizers and chemicals and the use of farm machinery on the floodplain, and would create beneficial impacts to quality of life, aesthetics, and recreational opportunities.

4.11.5 NAVIGATION EFFECTS

Development of side channels and chutes is not anticipated to impact the channel for barge traffic over the short-term or long-term. Potential cumulative impacts could only occur where there were several mitigation sites with side channels or chutes located in proximity to each other, however, if this was to be considered, sufficient engineering assessment and design would be done to ensure there would be no resulting cumulative effect on navigation.

4.11.6 WATER RESOURCES EFFECTS

Potential impacts to water resources associated with the mitigation and restoration of habitat must also be considered with other ongoing or planned activities within the ROI. As noted previously, the changes to Missouri River flows are being considered in the review and update of the Master Manual. A resulting change in flow from operation of the Mainstem Reservoir System could cause impacts to water resources. If implemented, the change in flows could modify floodplain configuration in certain areas along the river. Depending on the operational alternative selected, some areas of the floodplain could become seasonally wetter and other areas may

become seasonally drier. Development of habitat under the modified Mitigation Project would have to consider changes in Missouri River flows that could result from a general change in operation of the Mainstem Reservoir System or from adaptive management of the Mainstem Reservoir System. Therefore, Missouri River hydrology may change over time as Mainstem Reservoir System adaptive management strategies are implemented. The Corps would also implement adaptive management strategies for the modified Mitigation Project to ensure the viability of fish and wildlife habitat created or restored. Alterations may be required at certain locations over time should operation of the Mainstem Reservoir System change the flows that could affect fish or wildlife habitat quality.

Impacts to water resources from performance of mitigation and habitat restoration would be negligible in comparison to impacts caused by modifying flows through changes in operation of the Mainstem Reservoir System. As noted in Section 4.2, water quality would be slightly improved as a result of the modified Mitigation Project.

The conversion of 118,650 acres of cropland to conservation land use when combined with WRP, the Big Muddy NFWR, the Boyer Chute NWR, and other conservation programs would reduce the overall pollution loadings from nitrogen, phosphorous, and pesticides currently introduced to the floodplain from current agricultural use. The development of wetlands and the restoration of wetland areas for Mitigation Project sites can be designed to reduce non-point source loadings in the river. The restoration of side channels and the connection of wetlands to the river would provide water quality benefits by removing nutrients and contaminants from the river flow.

4.11.7 FLOOD CONTROL

The modified Mitigation Project, combined with other conservation projects in the floodplain such as the WRP and Big Muddy NFWR, would increase the river and floodplain storage capacity. Potential adverse impacts from modification to flood control structures are not anticipated from the modified Mitigation Project. However, modification to flood control structures under the Preferred Action could increase the flood storage capacity by setbacks of some levees. Changes in operation of the Mainstem Reservoir System could affect

flood potential along the Lower Missouri River depending on the operational alternative selected, however, a net cumulative increase in flood potential from the modified Mitigation Project and changes to operation of the Mainstem Reservoir System is not anticipated.

4.12 UNAVOIDABLE ADVERSE IMPACTS

Construction activities would result in some temporary, but unavoidable, disturbance to fish and wildlife, compaction of soils, destruction of vegetation, local increases of sediment loading, and increases in noise and fugitive dust. These impacts are considered to be less than significant. The increase in recreational use of the mitigation sites would likely result in an increase in vehicular traffic, noise, trespassing, and other human related disturbances in the area, however, these impacts are considered less than significant.

The modified Mitigation Project would remove up to 118,650 acres of agricultural land from crop production and from the tax base of the respective counties, however, the private agricultural land would be less than 1 percent of the agricultural land in the ROI, and it was estimated that the potential

adverse impact would be less than significant.

The primary anticipated unavoidable adverse effects would be localized at or in the immediate vicinity of the acquired mitigation sites. These less than significant adverse effects would be more than offset by the beneficial effects resulting from restoration of fish and wildlife habitat that are considered important to the Missouri River ecosystem.

4.13 RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

Farming is currently the primary activity of the Lower Missouri River floodplain where modified Mitigation Project sites may be acquired. Intensive agricultural use of the floodplain has occurred within the last 60 to 90 years. This represents a relatively short period of time. Land acquisition activities would result in the removal of land from agricultural production. The modified Mitigation Project would result in an increase in the long-term productivity of fish and wildlife habitat and populations. There would be a long-term decrease in the agricultural production of the Lower Missouri River floodplain. This decline in agriculture may result in a corresponding

decline in the sale of farm equipment and supplies within the ROI. These indirect effects are considered as less than significant. There would also be positive economic impacts from the reduction of government expenditures for disaster relief. However, the development of mitigation sites would result in a long-term increase in recreational use of the area and, consequently, an increase in the economic benefits resulting from recreational activities, such as hunting, fishing, bird watching, and other outdoor activities. A long-term increase in wetland acres would result in a corresponding increase in wetland function. Restored habitat would also increase the habitat value of the Missouri River floodplain ecosystem. The natural ecosystem benefits offered by the modified Mitigation Project are considered as a significant beneficial impact that would provide a long-term enhancement to the fish and wildlife resources of the Lower Missouri River ecosystem.

4.14 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible and irretrievable resource commitments would include the loss of the funds, labor, energy, and construction materials used to plan, design, construct,

and monitor the mitigation sites. The acquisition of land, in itself, would not represent an irreversible or irretrievable commitment of a resource because the land could be returned to cultivation or other use in the future, if such actions were directed by Federal policy.

4.15 COMPLIANCE WITH APPLICABLE FEDERAL ENVIRONMENTAL STATUTES AND REGULATIONS

The planning and implementation of individual mitigation sites would be required to comply with the procedural requirements of **NEPA** [42 USC 4321 et seq.]. NEPA is the process that Federal agencies use to evaluate the environmental impacts of a proposed project. NEPA procedures ensure that information about environmental impacts is available to public officials and citizens before decisions are made on Federal actions. The Corps' Reaffirmation Report (1990) directs the preparation of a DPR to document the planning and engineering for a particular mitigation site. Completion of a DPR provides the information needed to ensure compliance with respect to environmental considerations and consolidates the NEPA process into the Mitigation Project planning and implementation.

The Clean Water Act (CWA) [33 USC 1251 et seq., as amended] establishes Federal limits, through the NPDES, on the amounts of specific pollutants that are discharged to surface waters in order to restore and maintain the chemical, physical, and biological integrity of the water. An NPDES permit under Section 402 of the CWA is required for discharge of storm water from construction activities that disturb greater than five acres of ground surface. Measures for fulfilling the requirements of this permit would be addressed on a site-by-site basis.

Section 404 of CWA regulates the placement of dredged or fill material into the waters of the United States. Although the Corps is the authorizing agent for Section 404 permits it must still comply with the requirements of the CWA. Requirements for a permit under Section 404 and supporting information will be evaluated on a site-by-site basis. In addition, Section 401 of the CWA requires state agencies to certify that a project requiring a Federal permit to discharge complies with specific provisions of CWA.

The Rivers and Harbors Act of 1899 [33 USC 403] requires the Corps to determine if an activity will obstruct or alter a

navigable water by affecting the course, location, or capacity of the water. The development and implementation of a mitigation site would require compliance with Section 10 of RHA.

The Endangered Species Act [16 USC 1531 et seq.] requires Federal agencies to determine the effects of their actions and to avoid or mitigate potentially adverse impacts on Federally listed threatened or endangered species and their critical habitats. As part of this, the agency must use their authorities and programs to take steps to conserve and protect these species and habitat.

The National Historic Preservation Act [16 USC 470 et seq., as amended] requires Federal agencies to determine the effect of their actions on cultural resources (including historic, paleontological, and archaeological resources) and take certain steps to ensure these resources are located, identified, evaluated, and protected.

The Farmland Protection Policy Act [7 CFR 658] minimizes the extent to which Federal actions contribute to the unnecessary conversion of prime farmlands to nonagricultural use.

The Clean Air Act (CAA) [42 USC 7401 et seq., as amended] establishes Federal policy to protect and enhance the quality of the air to protect human health and the environment.

The Native American Graves Protection and Repatriation Act of 1990 directed Federal agencies to protect Native American human remains and associated burial items located on, or removed from, Federal land.

4.16 FWCA REPORT

This section includes the Corps' response to the five recommendations made by the USFWS in its Final FWCA Report (Appendix A).

Recommendation 1: "Build upon the existing momentum to increase restoration achievements through the expanded mitigation project. This should include a sustained commitment to project support and implementation in cooperation with the Service, the States, and the Tribes. Such a partnership will be necessary to fully realize the potential resource benefits of the ecosystem-level conservation efforts. A significant, long-term commitment to river restoration will most effectively ensure timely realty acquisition, planning, and

implementation of this ambitious and important mitigation project."

Corps Response: The project will continue to be subject to annual Congressional appropriations and continue to utilize the existing multi-agency coordination team for direction, site priority, and support for the acquisition, planning, and construction of individual mitigation projects.

Recommendation 2: "Incorporate adaptive management throughout project implementation. This may require innovative fiscal and planning mechanisms to address variable, and perhaps unpredictable, responses of individual projects, but will ultimately contribute to the program's success and emerging science of river restoration. An important aspect of adaptive management is a well-defined monitoring program to specifically target those resource questions of greatest interest and priority to the restoration efforts. Information gained through targeting monitoring not only can document physical and biological responses to restoration efforts, but can also be used to better design and operate specific mitigation measures in the future."

Corps Response: The project will continue to implement adaptive management as needed in an effort to maximize fish and wildlife benefits to the river. The project will continue to utilize the existing multi-agency coordination team for communication during project construction. The Report to Congress, required by Section 334 (b)(1) of the 1999 WRDA, included costs for project monitoring. A monitoring plan will be developed and implemented for the modified project.

Recommendation 3: “Investigate ways to assist the states in studies to better assess the economic impact of fish and wildlife restoration as a result of the mitigation project. This could be included as a component of a monitoring plan, or build on state efforts to characterize the importance of fish and wildlife-related activities along the river. Such a characterization would be an important evaluation of some of the public benefits derived from the mitigation project. It may also lead to a greater understanding and appreciation of the true value of fish and wildlife resources to the communities along the river.”

Corps Response: The project will continue to utilize the existing multi-agency coordination team, with representatives

from the state fish and game agencies, for direction, site priority, and support for the acquisition, planning, and construction of individual mitigation projects. Studies of the economic impact of the Mitigation Project could be conducted as part of a monitoring program for the modified project.

Recommendation 4: “Consider developing or providing for a database/bibliography of ongoing research and monitoring programs of mitigation sites to document resource response to restoration efforts. It is likely other federal agencies, the states and academia could provide much of this information to the Corps. Depending on the interest expressed, summaries of this information could be posted on a website for the general public who have substantial investment in the project.”

Corps Response: A database /bibliography of ongoing research and monitoring programs of mitigation sites to document resource response to restoration efforts could be prepared and maintained as part of the modified project and utilize funds from the project’s monitoring effort.

Recommendation 5: “Develop and expand outreach/education efforts

associated with the project. This could include providing outreach materials at rest areas, etc., near mitigation sites and better signage and interpretive aids at each site to inform the public of the objectives and accomplishments of the project. In addition, the Kansas City District has recently established a website that provides a variety of useful information and photos of mitigation areas. The Corps should continue to expand this site and perhaps link with a similar site on the Omaha District's web page. Such sites may also be a means to stimulate landowner interest in the mitigation program, or lead to partnerships with other conservation efforts."

Corps Response: The Corps will continue to strive and improve outreach/education efforts on the Mitigation Project. This on-going effort will include various media to present educational information on the project and include use of the Internet.